In This Issue:

Principles of Panoramic Reception • Polyphase R.F. Systems • “The Ghost of Guam” — KB6GJX

Radio on Leyte • A Compact V.F.O. With Stable Output • A Transmitter-Receiver for CAP-WERS
3AX.

Broadcasting service, 100 cycles for 8000, or 10,000 cycles are filter pre-

brated control. Loss affected by care of any

it is constant regardless of change in tone color, negligible change in vol-

United Transformer Co.
Hallicrafters will again assume its position of leadership in the field of peace time communications—with equipment especially designed to give new standards of transmitting and receiving performance on land, at sea or in the air. Communications receivers and transmitters for amateur and commercial use; two way radio telephones for marine and aviation use plus the finest kind of new equipment for further experiment and research at very high frequencies will all be included in Hallicrafters postwar production plans.

Hallicrafters RADIO

THE HALLCRAFTERS CO., MANUFACTURERS OF RADIO AND ELECTRONIC EQUIPMENT, CHICAGO 16, U.S.A.
EXACTLY five years ago—in 1940—Hallicrafters introduced a very high frequency communications receiver with a range of 27.8 to 143 Mc. This model was clearly five years ahead of its time in its anticipation of new and exciting possibilities for superior performance on the higher frequencies. Today Model S-36 stands by itself as the only commercially built receiver covering this range. It is outstanding for sensitivity, stability, high fidelity. With its extraordinary VHF versatility it is ready for immediate application in the ever widening fields of FM and higher frequency development work. Engineering imagination at Hallicrafters is reaching out beyond the next five years, beyond the present known limits of radio technique so that Hallicrafters equipment will continue to be always ahead of its time, above and beyond your best expectations.
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MAJOR PREMISE:
Bell Telephone System serves the American Public.

MINOR PREMISE:
Bell Telephone Laboratories develop the facilities of the Bell System.

CONCLUSION:
Therefore, Bell Laboratories serve the American Public.

And that is the raison d'être of the Laboratories. For the Bell Telephone System, the Laboratories carry on research studies in all the sciences and development work in all the engineering arts that relate to electrical communication.

For the Western Electric Company, the manufacturing unit of the System, the Laboratories develop equipment, prepare specifications for its construction, and engage in various engineering activities.

For the Armed Forces of the United States, under contracts of the Western Electric, the Laboratories have undertaken more than a thousand development projects — many with spectacular effect upon our enemies.
THE AMERICAN RADIO RELAY LEAGUE, INC.,

is a noncommercial association of radio amateurs, bonded for the promotion of interest in amateur radio communication and experimentation, for the relaying of messages by radio, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

It is an incorporated association without capital stock, chartered under the laws of Connecticut. Its affairs are governed by a Board of Directors, elected every two years by the general membership. The officers are elected or appointed by the Directors. The League is noncommercial and no one commercially engaged in the manufacture, sale or rental of radio apparatus is eligible to membership on its board.

"Of, by and for the amateur," it numbers within its ranks practically every worth-while amateur in the nation and has a history of glorious achievement as the standard-bearer in amateur affairs.

Inquiries regarding membership are solicited. A bona fide interest in amateur radio is the only essential qualification; ownership of a transmitting station and knowledge of the code are not prerequisite, although full voting membership is granted only to licensed amateurs.

All general correspondence should be addressed to the Secretary at the administrative headquarters at West Hartford, Connecticut.

Past Presidents

Hiram Percy Maxim, W1AW, 1914–1936
Eugene C. Woodruff, W8CMP, 1936–1940

Officers

President........................ GEORGE W. BAILEY, W1KH
Washington, D. C.

Vice-President..................... CHARLES E. BLALACK, W6GG
Yuma, Arizona

Secretary.......................... KENNETH B. WARNER, W1EH
West Hartford, Connecticut

Communications Manager............ F. E. HANDY, W1BDI*
Chevy Chase, Maryland

Treasurer.......................... DAVID H. HOUGHTON
West Hartford, Connecticut

General Counsel.................... PAUL M. SEGAL
1026 Woodward Building, Washington 5, D. C.

*On leave of absence. Address correspondence to the Acting Communications Manager, Charles A. Service, W4IE, West Hartford 7, Connecticut.
"IT SEEMS TO US—"

A BOVE 25

There is a long, long circuit path to be traced out before postwar allocations become final, with plenty of possibilities for unexpected blocking condensers, accidental grounds, mismatches and reflections. Yet much of the shape of the postwar radio world above twenty-five megacycles is made reliably visible by the Federal Communication Commission’s announcement of its intended allocations and the simultaneous embracing of these same allocations by the Interdepartment Radio Advisory Committee, as we report in this issue.

It is too early to count one’s megacycles, since there is still the possibility of some changes of importance, but the major outline is something that is certain to come into adoption and to endure for years in this country—and, we can reasonably expect, in much of the world.

We find the report, from our own amateur standpoint, something better than moderately good to look upon; and of its honesty, intelligence and general soundness in technical matters there can be no doubt—it is a remarkable job. It dealt with problems of appalling complexity and puts forth a reasoned and skillful answer which impresses us as being, all things considered, as good a job as one could hope for.

It is by no means a perfect plan in its amateur provisions, yet we have come closer to realizing our hopes and our demands than have any of the other services except aviation and the Government services; and, with some knowledge of the difficulties that confronted the Commission in finding provisions for all worthy services, we are reasonably content. The amateur is allotted a goodly collection of bands throughout the higher reaches of the spectrum, not as wide as they should be, not as close together as they should be, but sufficient to give us wide opportunities to go forward with the art and assuring us the “happy existence” in this part of the radio world which we so eagerly sought.

Once the allocation is made final it will be our duty to take stock, see precisely what we have, and begin laying plans for the most intelligent employment and development of each band. We hope that we shall be approaching that stage in our postwar thinking in just a month or two. We suggest that League members meanwhile study carefully the prospective amateur bands in the v.h.f., u.h.f. and s.h.f. ranges, and do what visualizing they can of the problems of organization and employment and technique, to be prepared to participate in the discussions which we hope to inaugurate shortly in our columns.

One of the most interesting of the Commission’s provisions, and certainly the most surprising, was that looking to the establishment of what they propose to call the citizens radio service, on 460–470 Mc. So interesting is this proposal that we reprint it, in its entirety, in another part of this issue for your information. Old-time amateurs will recall that there was a time when we spoke of ourselves as Citizen Radio, representing the private citizen’s only holdings of frequencies. When this new service is established we shall no longer have that sole honor. But amateurs we are, of course, and the new service will have nothing in common with us, since it is based upon utilitarian considerations and not on love of radio itself or personal interest in its techniques. In fact, we ourselves have from time to time proposed very much this same idea in rag-chews with Commission people, suggesting that the assignment of a few frequencies to the general public would relieve amateur radio of the pressure of those who improperly seek to employ its facilities only for utilitarian purposes. Our idea was that the Act might be amended to permit the operation, without licenses of any sort, of approved apparatus made by authorized manufacturers. License the set-maker, in other words, to turn out a foolproof set that would operate only on authorized frequencies, and which might therefore be employed without further formality by anyone who could purchase it. The Commission has chosen to set up the service within the existing Act, with licenses required but with the simplest possible licensing requirements.

What a mad world this band is going to turn out to be! The Commission properly says that its potentialities are limited only by one’s imagination. We, now, can imagine all sorts of things. We wouldn’t want to be FCC’s citizen licensing unit, not with our ability to imagine possibly millions of applicants. We won’t want to be an FCC district inspector during the first few years of this service, settling the quarrels over walkie-squawksy QRM and the tendencies to chop down each other’s masts which are practically certain to disfigure the activities of those who have not had the ama-
and worth the effort. It is going to mean great things to many chunks of our citizenry, particularly those who employ the apparatus and those who manufacture and sell it. If you see a manufacturer walking around with a certain gleam in his eye, it's probably not f.m. sets he's thinking about: it's citizens rigs, to be sold over the drugstore counter by the bushel. It will be a great little old market.

We figure that this thing will bring both some boons and some headaches to amateur radio. With the commercial employment of this service we have no concern, no interest. The individual "citizen" interests us mildly because his experiences may excite a real interest in radio and cause him to want to become an amateur. We suppose that there will be some "citizens" who attempt to crash our 420-450 band, particularly if manufacturers put out sets that cover both bands with the aim of including us in their market. (They should not, as our requirements are far from the same, but we suspect some of them will.) One thought which appeals to us particularly is that when the good old free-enterprise system gets to chewing on the 460-470 problems, with fat business profits in prospect, it's going to solve most of the apparatus and circuit problems for our near-by band. Inexpensive tubes, for instance. The bigger market will justify their development, and they'll be equally adaptable to 420-450 and the lower bands. Seems to us we can just about scratch the 420 band off our list of postwar development problems — the opening of the citizens service will do it for us. You'll be interested in reading, too, FCC's comparisons with amateur radio and its references to our League by name. That means some problems also, for we'll be looked up to as the model and called in to help in spots, we suppose. And the "citizens" will want to help in communications emergencies and some of them can possibly be welded into the plans of our Emergency Coordinators. A final thought amuses us: some of our XYLs who could never learn the code can at least qualify as citizens. But there is no provision for intercommunication with the amateur service, so we can see a lot of us OMs going for citizen tickets, too, so that some of the more chummy potentialities of this new service may be realized. In any event, we prophesy that the Citizens Radiocommunication Service is going to add a lot of zizz to the American scene.

**PHONETICS**

It has long been our point of view that there ought to be one uniform phonetic alphabet for use in amateur 'phone operation and that all amateur calls should be pronounced with these "alphabet words" rather than the letters. We haven't much cared what was in the word list, beyond the positive conviction that it should contain no place names.

In our joyous prewar days, our individualized and home-brewed phonetics gave color to amateur 'phone operation but frequently failed to add understanding. More scientifically constructed lists were used by the telephone, telegraph and radio companies and by the several branches of the military establishment but they differed, none was official except in its own service, and most of them were disfigured by the use of occasional geographical names — which can be alarmingly confusing in radio communication. On top of that we have, in the English language, both American and British practice — which, incidentally, must have caused a few headaches for CCB during the war. Back around 1938 FCC was toying with the idea of adopting an official list to be used by all amateurs, to facilitate monitoring identification, but nothing ever came of it. There is a word list in the Cairo Regulations but its use is compulsory only in the small-boat telephony service, which is chiefly a European institution. It is mostly of place names, mostly in their French rendering so that there are many of them that an American can't pronounce, and happily the regulation has had no applicability to other services.

At last a movement is on foot to do something about this need. The committees organized by the Department of State to advance proposals for the next world conference have before them a draft proposal suggesting that a word list be prepared in each official language and putting forward a suggested English list. The draft reads:

> Whenever, in conversations in the English language, it is necessary to identify individual letters of the alphabet, the following alphabet words shall be used:

<table>
<thead>
<tr>
<th>Alphabet</th>
<th>Word</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Able</td>
</tr>
<tr>
<td>B</td>
<td>Baker</td>
</tr>
<tr>
<td>C</td>
<td>Charlie</td>
</tr>
<tr>
<td>D</td>
<td>Dog</td>
</tr>
<tr>
<td>E</td>
<td>Easy</td>
</tr>
<tr>
<td>F</td>
<td>Fox</td>
</tr>
<tr>
<td>G</td>
<td>George</td>
</tr>
<tr>
<td>H</td>
<td>How</td>
</tr>
<tr>
<td>I</td>
<td>Item</td>
</tr>
<tr>
<td>J</td>
<td>Jig</td>
</tr>
<tr>
<td>K</td>
<td>King</td>
</tr>
<tr>
<td>L</td>
<td>Love</td>
</tr>
<tr>
<td>M</td>
<td>Mike</td>
</tr>
<tr>
<td>N</td>
<td>Nan</td>
</tr>
<tr>
<td>O</td>
<td>Oboe</td>
</tr>
<tr>
<td>P</td>
<td>Peter</td>
</tr>
<tr>
<td>Q</td>
<td>Queen</td>
</tr>
<tr>
<td>R</td>
<td>Roger</td>
</tr>
<tr>
<td>S</td>
<td>Sugar</td>
</tr>
<tr>
<td>T</td>
<td>Tare</td>
</tr>
<tr>
<td>U</td>
<td>Uncle</td>
</tr>
<tr>
<td>V</td>
<td>Victor</td>
</tr>
<tr>
<td>W</td>
<td>William</td>
</tr>
<tr>
<td>X</td>
<td>X-ray</td>
</tr>
<tr>
<td>Y</td>
<td>Yoke</td>
</tr>
<tr>
<td>Z</td>
<td>Zebra</td>
</tr>
</tbody>
</table>

There, it seems to us, is a beginning, and a good one, although Heaven only knows what the list will look like after the inevitable compromises with the British. (Or aren't they using it too for combined operations during the war?) But, as we say, we don't care much what is in the list provided it is technically sound; universally used, eschews geography, and escapes indecent accidental combinations. Any sound effort in this direction ought to be applauded by us all as contributing to the certainty of amateur communication.

K. B. W.
Polyphase Systems Applied to R.F.

Some Unique Uses of Two-Phase Driving Circuits

BY S/Sgt. ROBERT W. BICKMORE, W6QDV

Polyphase electrical systems have been widely used in many highly important electronic developments. However, their application to radio has been, for the most part, confined to power units and special devices such as the radio compass.

As pointed out in the following paragraphs, many useful applications for multiphase excitation are possible. Since two-phase radio-frequency voltage can be obtained from any r.f. generator very easily, compared with the much more difficult task of obtaining other polyphase voltages, this article will be confined entirely to two-phase systems. The general nature of basic applications and results is about the same as in more complex systems.

Up to the present time, the circuit shown in Fig. 1 has been the most common example of the employment of multiphasing in receivers and transmitters. This circuit is the basic discriminator arrangement, used in f.m. receivers to secure the audio component of the signal and in a.m. transmitters and receivers to correct the frequency drift of self-excited oscillators. Since its operation is explained fully in The Radio Amateur's Handbook and elsewhere, no attempt will be made here to go further into its principles of operation.

Automatic Resonating Circuits

Now consider the circuit of Fig. 2. It shows an oscillator-amplifier combination which appears conventional with the exception that both link coupling and capacity coupling are used simultaneously. With this arrangement the amplifier grids are driven 180 degrees out of phase (push-pull excitation) by virtue of the link coupling, as well as in phase (parallel excitation) by means of the capacity coupling to the center tap of the grid coil, L1. As a result there is a difference of 90 degrees between the two components of the driving voltage. However, the phase difference is exactly 90 degrees only when the tuned circuit, C1L1, is precisely in resonance at the excitation frequency. When this circuit is not at resonance the phase difference is not 90 degrees, and, furthermore, the potentials of the two grids are not equal.

This phenomenon may be usefully employed in an automatic resonating device, such as that shown in Fig. 3. A reversible motor, M, rotates C1 either clockwise or counter-clockwise (depending upon which side of resonance the circuit happens to be tuned) until the grid voltages are equal, and thereby automatically tunes the circuit to the excitation frequency. Condensers C2 and C3 are adjusted simultaneously for good sensitivity with minimum circuit loading and independently for equal cathode voltages on the 6H6 when C1L1 is at resonance.

RFQ is a sensitive meter-type relay movement featuring magnetic contacts and s.p.d.t. action with a neutral center position. The motor is one of the many small 115-volt a.c. models now obtainable, with an attached gear train giving various shaft speeds. A shaft speed of about one r.p.m. is suitable for most installations.

The plate tank circuit may be tuned by a similar arrangement. Alternatively, one autoresonator can be switched back and forth. In this case each tank circuit still requires its own motor, of course.

To obtain two-phase voltage in a following stage, it will be necessary to use the same dual-coupling method between stages, since one component cancels in the amplifier plate circuit.

Antennas

Now that the transmitter is tuned, what about the antenna? There happen to be a number of ways in which two-phase voltage can be used in the antenna circuit, aside from the autoresonator feature.

Multiphase excitation is new in amateur design. This article describes several simple applications which will automatically tune an amplifier stage to resonance or rotate an antenna pattern. The future possibilities of such systems appear to be almost limitless.

March 1945
Consider an ordinary horizontal half-wave antenna, fed at the center with tuned feeders one-quarter wavelength long, as shown in Fig. 4-A. Operated normally at one-quarter wavelength above ground, an antenna of this type is horizontally polarized and the angle of principle radiation in the vertical plane is close to 90 degrees, as shown in Fig. 4-B.

Now, let us suppose that the system is fed by capacitive coupling as shown in Fig. 5, with no inductive coupling whatsoever. The system then becomes a simple top-loaded vertical radiator, the fields of the horizontal portions canceling each other. This antenna is vertically polarized and the angle of principle radiation in the vertical plane is about 10 degrees, as shown in Fig. 5-B.

Combining the two systems and using both inductive and capacitive coupling, as shown in Fig. 6-A, we have the Iconoscan which has a vertical radiation angle which is varying constantly between 10 degrees and 90 degrees at a rate of twice the carrier frequency. This is that answer to high-frequency radiation problems, since it does much toward the elimination of fading caused by varying skip and weak signals which are the result of a critical reflection angle.

A variation of the feeding system which may be more convenient to use where the antenna cannot be located directly above the transmitter is shown in Fig. 7. Rather than bring the transmitter to the antenna, a “dog house” is made for the antenna-tuning apparatus which can be fed with any desired type of line. Incidentally, if the antenna tuning condensers are ganged, the autoresonator described previously will save many a trip to the roof. In this case it would be applied to the auxiliary tuned circuit, $C_1L_1$.

**Horizontal Coverage**

The final circuit to be discussed is interesting in that it appears at first glance that we are getting something for nothing. However, no matter how we figure it we can’t beat the power meter, as will be shown later. This circuit, shown in Fig. 8, is a familiar two-element antenna array which can be used for either end-fire or broadside radiation, depending upon how it is fed. As in the case of the Iconoscan, we shall feed it both in phase and 180 degrees out of phase.

When two-phase excitation is applied to this system, the lobes of maximum radiation will shift through 90 degrees at a rate equal to twice the carrier frequency. The result is an antenna system giving essentially equal radiation in all directions with a gain of approximately 3 db. over a half-wave dipole.

**Tuning and Loading**

Since most of us have enough trouble with single-phase systems, it might be well to go into

![Diagram](image)

---

**Fig. 4** — A — Half-wave antenna with quarter-wave tuned feeders and simple link coupling to the output stage. B — Pattern of vertical directivity.

**Fig. 5** — A — Same antenna as Fig. 4 with capacitive coupling to the center of the system. This places the two sections effectively in parallel, making the antenna a simple vertical top-loaded antenna having a vertical pattern such as that indicated in B.

---

12 QST for
the tuning and loading of these circuits. The curves in Fig. 9 show two voltages 90 degrees out of phase and the resultant of these two components. The two components add algebraically and reach a peak at \( \pi/4 \) and \( 5\pi/4 \). This peak has a value of 1.414 times the maximum value of either of the two components. Consequently,

\[
I_R = 1.414 I_A.
\]

In order not to overload the amplifier, the peak current must not exceed the normal current. Therefore, \( I_A \) must be reduced by a value of 1/1.414 and consequently must equal 70.7 per cent of its former value, so that

\[
0.707 I_A = 0.707 I_A - 0.707 I_L.
\]

It can now be seen that each coupling must be adjusted to draw 70.7 per cent of normal plate current and that, with both coupled, the resultant current will be 100 per cent of normal.

The easiest way to load the circuit is to disconnect the coupling condenser, couple the tank loosely with the link, and adjust both tuned circuits to resonance. Then the link should be un-

Assuming that each coupling loads the circuit to 100 per cent of normal,

\[
\begin{align*}
I_L &= I_n \sin \theta, \\
I_R &= I_n \sin (\theta + \pi/2), \\
I_L &= I_1 + I_2, \\
&= I_n \sin \theta + I_n \sin (\theta + \pi/2), \\
&= I_n \sin \theta + I_n \cos \theta.
\end{align*}
\]

Calculating the maximum value of \( I_R \),

\[
\frac{dI_R}{d\theta} = I_n \cos \theta - I_n \sin \theta = 0
\]

\[
\cos \theta = \sin \theta = 0.707, \\
\theta = \pi/4 \text{ and } 5\pi/4.
\]

Thus,

\[
I_R = 1.414 I_n.
\]
**THE F.C.C. REPORT**

Last autumn FCC held a hearing on post-war allocation that lasted six weeks. It heard 231 witnesses in 4200 pages of testimony, plus hundreds of exhibits. There followed some months of intensive staff work, plus a series of conferences with IRAC to reconcile conflicts with Government requirements. On January 15th FCC issued a 265-page document, a report on its proposed allocations above 25 Mc. Objectors will have an opportunity in February to file briefs and argue for changes, following which the Commission is expected, in early March, to confirm the allocation or without changes. On January 15th IRAC also modified its pending proposal with the Department of State, as concerns the frequencies above 25 Mc., to coincide exactly with the FCC report. Thus there is now only one American plan.

The amateur frequencies, in megacycles, are as follows: 28-30, 50-54, 144-148, 220-225, 420-450, 1125-1225, 2500-2700, 5200-5750, 10,000-10,500, and 21,000-22,000.

A similar FCC report dealing with the longer-distance frequencies below 25 Mc. is not to be expected for some weeks to some months yet. The report is one of the most thorough and comprehensive radio documents that we have ever seen. It is in three parts. Part I, in five sections, discusses the preliminary work done by the industry and FCC prior to the hearing, describes the hearing, summarizes the requests of non-Governmental services (which greatly exceeded the available frequencies), states the principles upon which the proposed allocation is based, and gives the table showing the Commission's proposed allocation above 25 Mc. Part II is a discussion of the proposed allocation in nineteen sections, each devoted to a particular radio service, of which amateur radio is Sec. 6. Part III is a discussion of frequencies, in convenient steps beginning at 25 Mc.

As we prophesied, the report bears a marked resemblance, in its major outlines, to the original IRAC proposal. We do not know, of course, what judgment posterity will place upon this allocation and we are not able to judge its provisions for some of the radio services with which we are not too familiar, but it is obviously a masterly and thoughtful job, a very hard piece of work by many people over many months, and in its essentials technically sound.

Government gets roughly half the frequencies. The report makes comprehensive provision for the usual fixed and mobile public services. International broadcasting is described as "a service of great significance" and although FCC canceled its unused assignment above 25 Mc. it says that it will endeavor to assign it adequate frequencies below 25 Mc. when that portion of the work is reached. F.m. is to be expanded and moved, to 90 channels from 84 to 102 Mc., of which 84-88 will be for noncommercial educational stations. The major provision for television is "upstairs," 480-520 Mc.; but it also retains 12 channels below 225 Mc., being 44-84 minus our band 50-54, plus 180-216 Mc. Facsimile may use the f.m. channels, plus 470-480. Elaborate provision was made for aviation. Police channels in the 30-44 Mc. band were increased from 29 to 56, plus a new band, 152-156 Mc. Facilities of numerous other services were preserved or expanded. Provisions were made for several new services, including railroads. A startling new one is called Citizens Radiocommunications Service, with the assignment of 490-470 Mc. and the promise of minimum licensing requirements — of which we shall make further report in QST. Numerous proposals were dismissed by the Commission as unworthy of frequencies and most services received far less than they requested.

The accompanying table gives the major provisions of the proposed allocation, minus innumerable notes relating to special provisions, power, shared use, etc., for services other than amateur.

Sec. 6 of Part II, the section dealing with the amateur radio service, occupies six pages of the report. It praises amateur radio highly; makes frequent reference to the transcript of the hearing (our testimony); describes past amateur allocations; reports our requests at the hearing; lists the proposal of the Commission for the allocation of frequencies to amateurs, above 25 Mc., as listed above; and then comments on the proposed allocation in the following language:

The number of frequency bands allocated to the amateur service and their positions in the frequency spectrum have been established with regard to the needs of governmental services, as well as services administered by the Commission.

The 28-30 Mc. band presently assigned to the amateur service will remain unchanged under the proposed allocation. The amateur frequencies have been shifted from the 56-60 Mc. band to the 50-54 Mc. band, thereby permitting the Television Channel No. 2 to fall between 54-60 Mc. It is thought that this shift will not interfere with amateur operation other than with respect to the slight advantages of harmonic relationship between amateur bands, and will result in a substantial benefit to television. It will permit the assignment of 4 out of 6 channels instead of 3 out of 6 channels in a highly congested area.

When joining the League or renewing your membership, it is important that you show whether you have an amateur license, either station or operator. Please state your call and/or the class of operator license held, that we may verify your classification.

(Continued on page 16)
### TABLE OF PROPOSED ALLOCATIONS ABOVE 25 MC.

<table>
<thead>
<tr>
<th>Megacycles</th>
<th>Proposed International Allocation</th>
<th>Proposed U. S. Allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>25.015-27.305</td>
<td>Fixed; mobile except aeronautical and maritime</td>
<td>Government and non-Government fixed and mobile</td>
</tr>
<tr>
<td>27.305-27.335</td>
<td>Industrial, scientific and medical devices</td>
<td>Industrial, scientific and medical devices</td>
</tr>
<tr>
<td>27.335-28.000</td>
<td>Fixed; mobile except aeronautical and maritime</td>
<td>Government and non-Government fixed and mobile</td>
</tr>
<tr>
<td>28.000-30.000</td>
<td>Amateur</td>
<td>Amateur</td>
</tr>
<tr>
<td>30.000-40.900</td>
<td>Fixed; mobile except aeronautical</td>
<td>(Roughly, alternate megacycles to Government and non-Government, fixed and mobile, per elaborate list.)</td>
</tr>
<tr>
<td>40.900-41.000</td>
<td>Industrial, scientific and medical devices</td>
<td>Industrial, scientific and medical devices</td>
</tr>
<tr>
<td>41.000-42.000</td>
<td>Fixed, mobile, except aeronautical</td>
<td>Government</td>
</tr>
<tr>
<td>43.000-44.000</td>
<td>Fixed; mobile except aeronautical</td>
<td>Non-Government fixed and mobile</td>
</tr>
<tr>
<td>44.000-50.000</td>
<td>Broadcasting; fixed; mobile</td>
<td>Television</td>
</tr>
<tr>
<td>50.000-54.000</td>
<td>Amateur</td>
<td>Amateur</td>
</tr>
<tr>
<td>54.000-78.000</td>
<td>Broadcasting; fixed; mobile</td>
<td>Amateur</td>
</tr>
<tr>
<td>78.000-84.000</td>
<td>Broadcasting; fixed; mobile</td>
<td>Television</td>
</tr>
<tr>
<td>84.000-88.000</td>
<td>Broadcasting</td>
<td>Television</td>
</tr>
<tr>
<td>88.000-102.000</td>
<td>Broadcasting</td>
<td>Television</td>
</tr>
<tr>
<td>102.000-108.000</td>
<td>Broadcasting; fixed; mobile</td>
<td>Television</td>
</tr>
<tr>
<td>108.000-112.000</td>
<td>Air navigation (localizers)</td>
<td>Government</td>
</tr>
<tr>
<td>112.000-118.000</td>
<td>Air navigation (ranges)</td>
<td>Government</td>
</tr>
<tr>
<td>118.000-122.000</td>
<td>Aeronautical mobile (airport)</td>
<td>Government</td>
</tr>
<tr>
<td>122.000-132.000</td>
<td>Aeronautical mobile</td>
<td>Government</td>
</tr>
<tr>
<td>132.000-144.000</td>
<td>Aeronautical mobile; fixed</td>
<td>Government</td>
</tr>
<tr>
<td>144.000-148.000</td>
<td>Amateur</td>
<td>Amateur</td>
</tr>
<tr>
<td>148.000-152.000</td>
<td>Fixed; aeronautical mobile</td>
<td>Government</td>
</tr>
<tr>
<td>152.000-156.000</td>
<td>Fixed; mobile except aeronautical</td>
<td>Police</td>
</tr>
<tr>
<td>156.000-162.000</td>
<td>Fixed; mobile except aeronautical</td>
<td>Non-Government fixed and mobile</td>
</tr>
<tr>
<td>162.000-170.000</td>
<td>Fixed; mobile</td>
<td>Government</td>
</tr>
<tr>
<td>170.000-180.000</td>
<td>Navigation aids</td>
<td>Non-Government fixed and mobile</td>
</tr>
<tr>
<td>180.000-192.000</td>
<td>Broadcasting; fixed; mobile</td>
<td>Television</td>
</tr>
<tr>
<td>192.000-216.000</td>
<td>Broadcasting; fixed; mobile</td>
<td>Government</td>
</tr>
<tr>
<td>216.000-220.000</td>
<td>Fixed; mobile</td>
<td>Government</td>
</tr>
<tr>
<td>220.000-225.000</td>
<td>Amateur</td>
<td>Amateur</td>
</tr>
<tr>
<td>225.000-400.000</td>
<td>Fixed; mobile</td>
<td>Government</td>
</tr>
<tr>
<td>400.000-420.000</td>
<td>Fixed; mobile</td>
<td>Government</td>
</tr>
<tr>
<td>420.000-450.000</td>
<td>Air navigation and amateur</td>
<td>Government</td>
</tr>
</tbody>
</table>

**Note.** To be used temporarily for "special" air navigation aids, fixed to be exclusively amateur when no longer required for "special" air navigation aids; meanwhile amateur power to be limited to 50 watts.

All non-Government services will be established in the bands above 450 Mc. on an experimental basis pending adequate showing as to need and technical requirements.

<table>
<thead>
<tr>
<th>Megacycles</th>
<th>Proposed International Allocation</th>
<th>Proposed U. S. Allocation</th>
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<tr>
<td>450.000-460.000</td>
<td>Air navigation</td>
<td>Temporarily special air navigation aids; thereafter non-Government fixed and mobile</td>
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<tr>
<td>460.000-470.000</td>
<td>Fixed; mobile</td>
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<tr>
<td>470.000-480.000</td>
<td>Broadcasting</td>
<td>Facsimile broadcasting</td>
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<td>Broadcasting</td>
<td>Television</td>
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<td>508.000-524.000</td>
<td>Air navigation aids</td>
<td>Temporarily air navigation aids; thereafter television</td>
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<tr>
<td>524.000-530.000</td>
<td>Broadcasting</td>
<td>Television</td>
</tr>
<tr>
<td>530.000-545.000</td>
<td>Navigation aids</td>
<td>Experimental broadcasting services</td>
</tr>
<tr>
<td>545.000-560.000</td>
<td>Fixed; mobile</td>
<td>Navigation aids</td>
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<tr>
<td>560.000-570.000</td>
<td>Amateur</td>
<td>Amateur</td>
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<td>570.000-600.000</td>
<td>Television relay</td>
<td>Television relay</td>
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<tr>
<td>600.000-620.000</td>
<td>Fixed; mobile except aeronautical</td>
<td>Government</td>
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<td>620.000-650.000</td>
<td>Fixed; mobile</td>
<td>Air navigation aids</td>
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<td>Aeronautical mobile</td>
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<td>670.000-700.000</td>
<td>Fixed; mobile</td>
<td>Aeronautical mobile</td>
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<td>700.000-705.000</td>
<td>Fixed; mobile except aeronautical</td>
<td>Government</td>
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<tr>
<td>705.000-710.000</td>
<td>Fixed; mobile</td>
<td>Government</td>
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<tr>
<td>710.000-715.000</td>
<td>Amateur</td>
<td>Amateur</td>
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<td>715.000-730.000</td>
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<td>Government</td>
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<td>730.000-750.000</td>
<td>Fixed; mobile</td>
<td>Non-Government fixed and mobile</td>
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<td>750.000-755.000</td>
<td>Fixed; mobile except aeronautical</td>
<td>Government</td>
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<tr>
<td>755.000-780.000</td>
<td>Fixed; mobile</td>
<td>Government</td>
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<td>780.000-800.000</td>
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<td>840.000-860.000</td>
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<tr>
<td>990.000-1000.000</td>
<td>Fixed; mobile</td>
<td>Government</td>
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</tbody>
</table>

March 1945
The 112-116 Mc. band formerly assigned to the amateur service was requested for exclusive assignment in the United States. The proposed allocation of the spectrum for which allocations are being made, the reason we incorporated in our presentation an alternative set of frequencies which has now been granted. It would have been somewhat more realistic for FCC to frame its comments in terms of our secondary proposal, rather than our primary one, as it could thereby show that what it gave us was a fairly close approximation of what we asked for. Our alternative request was for 144-149, 218-225, 420-460, 840-900, 1125-1225, 2500-2700, 5200-5750, 10,000-10,500, and 21,000-22,000 Mc.

In Part III of the report, the discussion by frequencies, discussing 25-30 Mc., the Commission observes that "The range 25 to 30 Mc. is presently assigned to the amateur service and the proposed allocation is the same." Discussing 50 to 60 Mc., it says:

This portion of the spectrum is presently divided between television broadcasting and the amateur services. The Commission observes that "The range 25 to 30 Mc. is presently allocated to the amateur service. Here it will be noted that this proposed amateur band is adjacent to a proposed Government band. From this point on up to 30,000 megacycles, similar contiguous assignments of Government and amateur bands are made. The reason for this is to locate the amateur bands at points where in time of war or national emergency they may be used for the expansion of essential Government radio services. It is felt that this arrangement of contiguous Government and amateur bands is more important than the preservation of strict harmonic relations between the amateur bands.

Well, fellows, there you have it. As concerns the region above 25 Mc., this is what has come out of the months of meetings, testifying, writing, negotiating and arguing. Remembering that this is still a proposal, not yet final, we can still take stock. The 10-meter band, often threatened, is untouched. The 5-meter band, constantly under the stock. The 10-meter band, often threatened, is untouched. The 5-meter band, constantly under the

Throughout the foregoing paragraphs, as they relate to frequencies above 100 Mc., the Commission speaks in terms of our primary request for an upward extension of our harmonic family. We ourselves perceived the developing conflicts with many proposed Government assignments, as so frequently mentioned by FCC. For that very reason we incorporated in our presentation an alternative set of frequencies above 100 Mc., which we said would be equally acceptable to us if FCC found it more readily possible to provide. This alternative set of frequencies was substantially the IRAC proposal, which we knew had the right of way. It is substantially this alternative set of frequencies which has now been granted. It would have been somewhat more realistic for FCC to frame its comments in terms of our secondary proposal, rather than our primary one, as it could thereby show that what it gave us was a fairly close approximation of what we asked for. Our alternative request was for 144-149, 218-225, 420-460, 840-900, 1125-1225, 2500-2700, 5200-5750, 10,000-10,500, and 21,000-22,000 Mc.
Bear in mind that this allocation is not yet final. The ARRL Board of Directors has voted to accept the results as concerns amateurs, feeling that we have here an allocation that will well take care of our needs. Some of the displaced commercial services, notably F.M., are known to be displeased with the proposal and will doubtless protest, with the possibility of continuing pressure on some of our bands. Thus it will not be over until it is over and, although the League does not expect to be filing briefs and appearing in argument, we shall continue on the job of looking after our interests until the allocation is made final. We shall quite possibly be able to report the final results in our next issue.

Meanwhile the FCC-IRAC recommendations to the Department of State become the basis for the United States' preparations for the Rio conference in June, work on which is expected to begin in February.

HAVE YOU REGISTERED?

PARDON us if we keep on talking about that coupon at the top of this page, but if you are an American or Canadian amateur, using your radio knowledge in the war effort, and haven't yet registered the simple facts with us, we want to hear from you.

The reason is that we are compiling at ARRL HQ, a card record of the amateur service in the war — whether in the armed forces, the seagoing services, the Civil Service, or industry which is wholly devoted to the war effort. The information we need is shown on the form and is so simple that you can do the whole job in a minute — or repeat the essentials on a post card if you don't wish to cut your copy of QST. But please see that we have the data on you, so that this record for posterity and for the future protection of the amateur may be as nearly complete as possible.

And if you can send us similar data on your associates of amateur background, it will help a lot. TU.

March 1945
Panoramic Reception

A Review of Its Principles in Simple Language

BY HARVEY POLLACK, W2HDL

At a desolate, lonely post in the heart of the Allied lines in Burma, a Marine radio operator was grimly monitoring the bands used by the Japs for field orders. Before him were several communications receivers, each surmounted by a smaller cabinet containing a cathode-ray tube. His alert glance shifted from one to another of the fluorescent screens while he continually checked the frequency sheet used by the various Allied mobile and fixed transmitters in the area. The constantly shifting pattern of radience was so familiar to his trained eye that only cursory and occasional corroborations were necessary; he knew almost instinctively that every station on the air was that of a friendly post.

Suddenly, and without warning, a small peak appeared on one of the screens where none had existed before. It stood out like the shoe-button eye of a snow man.

"Japs!" muttered the operator. "And mobile, too. Look at that peak grow! Only thing that could come that fast is a flight of planes."

Just as suddenly the peak winked out and the scene was restored to its former serenity. But the cat was out of the bag. The operator reached for the land-line transmitter and spoke a few clipped words into the mouthpiece.

Almost instantly, at far-flung and widely separated aircraft installations, a sharp alert was sounded as the men took their stations. Long before the Japs came within striking distance, the Allied fighters met them head on.

The Japs never had a chance.

What the Panoramic Receiver Tells Us

The cathode-ray unit which makes such feats and many others possible is the panoramic adaptor which may be added to almost any type of receiver. Technically, panoramic reception is defined as the simultaneous visual reception of a multiplicity of radio signals over a broad band of frequencies. In addition, panoramic reception provides an indication of the frequency, type and strength of signals picked up by the receiver. Deflections or "peaks" appearing as inverted Vs on the screen of a cathode-ray tube, as shown in Fig. 1, are indicative of the presence of signals. The character of each individual deflection tells its own story. For instance, in Fig. 1, a is a signal of constant amplitude indicating a steady carrier, while b is a nonvarying signal whose strength is about twice that of a. The signal indication at c is a peak which appears and disappears so rapidly that the base line appears closed beneath the deflection. This type of trace is produced by a very rapidly keyed c.w. signal. With slower keying the base line would appear open. Incidentally, if the keying is sufficiently slow the code can be read directly from the screen, like a blinker, after a little practice.

Fig. 1 — Typical signal patterns on the screen of the cathode-ray tube of the panoramic receiver. The peaks a and b indicate a c.w. signal or unmodulated carrier. The closed baseline of c indicates a rapidly keyed c.w. signal, while d's irregular shape identifies it as a modulated carrier. The signal at d is composed of separate parts. The smaller peaks are produced by the sidebands of a modulated carrier, while the high center peak is produced by the carrier itself. Hence, this is the picture of a 'phone station. More often the sidebands will not be visible as separate deflections, a 'phone station trace being recognizable rather by a deflection which tends to vary in amplitude between the high center peak and the low center peak.

The various frequencies shown may be compared with reference to each other or to the calibrated dial of the receiver. As an illustration, imagine that the receiver dial reads 5000 kc. Signal c, the c.w. signal discussed previously, appears immediately above zero on the scale. This scale reading indicates that the frequency of the signal is that indicated on the dial of the receiver; in other words, 5000 kc. Another way of saying the

* Engineering Dept., Panoramic Radio Corporation.
same thing is that the frequency difference between the receiver dial reading and the signal appearing over the center of the scale marking is zero. It follows from this that signal a is 100 kc. lower than signal c, or 4900 kc., while signal b is approximately 65 kc. lower than signal c, or 4935 kc. Hence, while signal c is heard on the receiver's normal output circuit, the other signals will be seen distributed as shown in the diagram. They will not be heard in the headphones, however, unless they happen to be close enough to c in frequency to be within the receiver's normal band of acceptance.

Application to Amateur Bands

For the sake of clarity, let us choose the 3.5-Mc. amateur band for our discussion. This band extends from 3.5 Mc. to 4.0 Mc. and is shown graphically in Fig. 2. Now let us say that the receiver has been equipped with a panoramic adaptor which covers a maximum band-width of 200 kc. and that the receiver has been tuned to 3.7 Mc. All of the signals between 3.6 and 3.8 Mc. will be visible on the screen of the cathode-ray tube in the adaptor. The signal heard on the headphones will appear at the center of the screen as signal c. Now to listen to signal a, the receiver would have to be tuned to a lower frequency.

As the receiver tuning is shifted, all of the peaks will move to the right across the screen until signal a is heard. At that point, a will appear centered on the screen as shown in Fig. 3. Signal c now has moved to the right of the screen and is visible but no longer audible in the headphones; b has passed through the center of the screen and might have been heard for an instant as it passed the center point of the screen. At the same time, new signals d, e and f, which were not present previously now have made an appearance at the left side of the screen since the 200-kc. acceptance band has been shifted lower in frequency. Because the signals in this part of the band all are greater in sweep width. Not only does this feature permit visual inspection of signals which otherwise might interfere with each other, but also it makes possible the analysis of signals which are heterodyning one another. If we should be in the middle of a QSO when QRM starts to wash it out, a quick reduction in sweep width will disclose the side (high- or low-frequency) where the heterodyne modulation is taking place. A break-in flash to the other end — such as "shift two or three kc. higher" — will suffice to shift the QSO to clearer channels.

In general, then, just as a crystal filter or a variable i.f. control on a receiver is employed when congestion in the band warrants it, the variable sweep-width feature of the adaptor meets the problem of visual interference.

Superheterodyne Fundamentals

For the benefit of those who have permitted themselves to become rusty in elementary superhet-receiver theory, let us first review the principles upon which this type of receiver is based. Let us assume that a radio signal whose frequency is 100 kc. is to be received. Referring to Fig. 5, the 1000-kc. signal is fed into a tuned stage called e.w., the deflections will appear and disappear in accordance with the keying. Should we now tune to the 'phone band the signals will appear as peaks pulsating in amplitude. This effect, as explained previously, is caused by the modulation.

Sweep Width

Another feature of an adaptor of this type is that the number of kilocycles visible at any time (sweep width) is under the direct control of the operator and may be reduced to any lesser value all the way down to zero if so desired. This control provides the operator with a visual selectivity control of the most flexible variety. As the sweep width is reduced, the resolution constantly improves. The term "resolution" is used here in the same sense as the word "selectivity" is used in discussing the frequency discrimination of receivers. Fig. 4 should help to illustrate this point. Two signals differing in frequency by 3 kc., let us say, will present the appearance shown in Fig. 4-A if the sweep width control is set at its maximum point. Now, as this control is backed off, the signals will appear to separate and at about 20 per cent of maximum they will appear somewhat as presented in Fig. 4-B. This increase in visual selectivity may be carried still further by a
the converter. At the same time the h.f. oscillator of the converter feeds a signal of 1400 kc. into the mixer section. When these signals are combined in the mixer, a new frequency representing the difference between the two original frequencies appears in the output. In this case the difference frequency (or intermediate frequency) is 400 kc. Of course, the original frequencies are still present, plus a fourth frequency equal to the sum of the original frequencies, but the tuning of the following i.f. amplifier is so sharp that only the 400-kc. signal is permitted passage. Following the highly selective intermediate-frequency amplifier, the signal is detected or demodulated, the modulation being amplified through the audio amplifier to a sufficiently high level to operate a speaker or headphones.

Thus we have:

Oscillator frequency: 1400 kc.
Signal frequency: 1000 kc.
Intermediate frequency: 400 kc.

Now, should we desire to listen to a station at 1300 kc., we would rotate the tuning-condenser knob to the new position. Since a ganged tuning condenser is usually employed, in so doing we have changed both the frequency to which the converter is tuned and the oscillator frequency and we now have:

Oscillator frequency: 1400 kc.
Signal frequency: 1300 kc.
Intermediate frequency: 400 kc.

It will be noted that the i.f. has not changed because we have maintained a constant difference between the signal frequency and the oscillator frequency. Thus the tuning of the i.f. amplifier may be fixed for all signal frequencies so long as the oscillator frequency "tracks" 400 kc. higher (or lower if desired) in frequency than the frequency of the incoming signal. In this case, the i.f. amplifier is tuned to 400 kc. and left there.

It is obvious that many signals differing quite widely in frequency are inducing their respective voltages in the antenna. Although the input circuit of the converter stage is tuned, its selectivity is so poor that signals differing by several hundred kilocycles from the one to which the receiver is tuned will appear at the grid of the converter tube, with only slight attenuation below that of the signal to which the receiver is tuned. Thus, with the response characteristic shown in Fig. 5, the amplitudes of signals at 900 and 100 kc. are only slightly below the amplitude of the signal at 1000 kc. to which the receiver is tuned.

Starting with the assumption that several signals of equal strength reach the antenna, the signal to which the converter is tuned will be the strongest, as we have seen, while the others which are off resonance will fall off in relative strength to a degree depending upon the frequency separation from the frequency to which the converter input is tuned. Although it would be impossible to receive these signals simultaneously by the usual aural method without interference, we shall see that this can be done visually by panoramic reception.

The Panoramic Adaptor

A small portion of the voltage developed by each of these input signals is taken from the output of the converter and fed into the r.f. amplifier of the panoramic adaptor which is broadly tuned with the i.f. of the receiver (400 kc.) as its center frequency. It will be noted from Fig. 5 that the input circuit of this stage is designed to have a response characteristic opposite to that of the input circuit of the receiver's converter stage, the ultimate effect being to compensate for the dropping off of signals off resonance in the converter stage, so that all signals of equal strength at the antenna again are essentially equal in strength at the grid of the adaptor r.f. stage.

The signal from the r.f. stage is fed into a converter stage whose input circuit also is broadly

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**Fig. 5** — Block diagram of the various units comprising a superheterodyne receiver with panoramic adaptor. The accompanying graphs serve to illustrate the tuning characteristics of the principal units of the system.
tuned to accept all signals delivered to it by the r.f. stage with as little attenuation as possible. The local oscillator used in connection with this converter is normally tuned to a frequency 200 kc. higher (or lower) than the center frequency of the band accepted by the converter input circuit to produce an i.f. of 200 kc. However, the frequency to which this oscillator is tuned does not remain constant as it does in the receiver proper. Its tuning continually is varied or swept over a selected range of frequencies so that at some point in its excursion it mixes or beats with each one of the signals appearing at the input of the adaptor converter to produce the required i.f. of 200 kc. Thus when this oscillator’s frequency is 500 kc., it beats with the 300- kc. signal to produce an i.f. of 200 kc. to which the following i.f. amplifier is sharply tuned. Similarly, when the oscillator’s frequency is at the other end of its range, 700 kc., it beats with a 500-kc. signal again to produce an i.f. of 200 kc.

Cathode-Ray Indicator

The output of the adaptor’s i.f. amplifier is rectified and the resulting d.c. voltage is applied to the vertical deflecting plates of the cathode-ray tube. We know that with no voltage on either vertical or horizontal deflecting plates the spot on the screen of the cathode-ray tube normally will be stationary at the center of the screen. If, however, a varying voltage is placed across the vertical deflecting plates, the spot will move in a vertical direction, forming a luminous line if the variations in voltage are sufficiently rapid to create persistence of vision. Therefore, if we were to tune the adaptor’s oscillator to beat with one of the signals at the input of the adaptor, the output voltages of the rectifier following the i.f. amplifier would follow a curve similar to the response curve shown for the adaptor’s i.f. amplifier in Fig. 5, and if this voltage is applied to the vertical deflecting plates of the cathode-ray tube, the spot will move upward from the center and then back to center as the beat between the oscillator and the signal approaches the i.f. of 200 kc. and then recedes after passing through maximum at 200 kc. If the tuning of the oscillator in this manner is done repeatedly and at a high rate of repetition, a vertical line would appear on the screen of the cathode-ray tube.

* Now, if at the same time a smoothly varying voltage is applied to the horizontal plates, the spot will move under the influence of a horizontal as well as a vertical force and the resulting path will resemble the i.f. response curve.

Electronic Tuning

In the panoramic adaptor, the tuning of the oscillator is not done manually, of course, but this is accomplished by a reactance modulator whose characteristics are such as to sweep the frequency of the oscillator back and forth over the proper range at a rate corresponding to the rate of oscillation of a second special oscillator called the b.t.o. (blocking-tube oscillator). Voltage from the b.t.o. also is fed to the horizontal deflecting plates of the cathode-ray tube so that the spot when no signal is present at the input of the adaptor is moved back and forth horizontally in synchronism with the sweeping of the adaptor’s converter oscillator. If signals are present at the input of the adaptor, they will cause vertical deflections whenever the oscillator’s frequency is appropriate to produce the required 200- kc. i.f. and these signals will then be reproduced in succession as indicated in Fig. 5. Normally, the sweeping action is set at a repetition rate of about 30 cycles per second, any rate which will maintain persistence of vision being adequate.

Ham Applications

It is not difficult to visualize many ways in which panoramic reception may be applied in postwar ham work. It is, of course, very easy to spot an unoccupied channel on the screen of the cathode-ray tube, and just as easy to watch the e.o.c. of the station’s transmitter walk up to the vacant hole as the operator tunes it to the proper frequency. Not only is the lining up of stations in a spot-frequency net facilitated, but if net stations or stations in a “round-table” are operating on scattered frequencies, the control-station operator can keep tabs on all of them without disturbing the setting of his receiver. This sort of visual reception is valuable in many other practical operating tricks.

By the pattern on the screen, it is possible to check percentage of modulation, comparative signal strength, carrier shift and other signal characteristics. With the sweep width reduced to zero, the panoramic receiver becomes an oscilloscope. With a calibrated scale on the screen accurate frequency checks may be made.

While it is not probable that many operators could develop visual code-copying speed comparable with the speeds possible by ear, it should not be difficult for any ham to develop his eye to the point where he readily could recognize such things as the “CQ SS” of a Sweepstakes contest!

Strays

A widely-known manufacturer of radio receivers recently agreed to cease and desist from representing that any receiver it sells contains a designated number of tubes or is of a designated tube capacity, when one or more of the tubes referred to do not perform the recognized and customary functions of radio tubes in the detection, amplification and reception of radio signals.
A “Handbook” on Leyte

The Dramatic Story of a Radio Network Established by Guerrilla Forces in the Philippines

BY CYRUS T. READ,* W9AA

Presented herewith is a true story which we would have hesitated to print as fiction. We have long known that our Handbook contains all the information necessary to build and operate a complete radio station, but we never expected anyone to start from scratch and produce a whole radio system out of it while fighting Japs on the side. Former Assistant Secretary Cy Read heard a fragment of this yarn and, recognizing the interest it would hold for all hams, took time out from his regular job to pinch hit as a QST reporter once again. The result is this interview with Lt. Richardson.

LT. ILIFF RICHARDSON, USNR, never was a ham. Indeed, prior to January, 1944, he was completely unacquainted with the technical side of radio. His hobby was gas engines, motorcycles and the like, and, while he didn’t say much about it, we got the impression that he really knew his way around in that field. Today, however, he knows his way around in radio equally well — and how he got that experience is one of the most amazing stories we have ever heard.

The chain of circumstances by which Lt. Richardson arrived on Leyte Island in the Philippines is too long to recount here. The full story will be told in the book, “History Island — The story of an American Guerrilla on Leyte,” by Ira Wolfert,¹ which is being previewed in the March issue of The Reader’s Digest. Suffice it to say that Lt. Richardson was executive officer aboard a PT boat, one of the group immortalized in “They Were Expendable,” and his boat was among those which did not get away. At the time our story opens he was chief of staff of the guerrilla forces on Leyte.

In January, 1944, General MacArthur’s headquarters got in touch with the guerrillas. Plans were already under way for the reconquest of the Philippines, and there was important work to be done. The principal assignment, prior to the actual invasion, was the setting up of ship-watching posts and the construction of radio stations to report the movement of Jap convoys. This was a “must,” and nothing could be permitted to interfere with it.

Not that there weren’t a few slight obstacles to be overcome at the start. First, the place was infested with Japs — who, presumably, would hardly approve of this ship reporting service, and who were well equipped with radio direction finders. Second, aside from the Jap installations there wasn’t a radio transmitter on the island, and none could be sent in. Finally, not a man in the outfit had ever had any real radio experience.

Nevertheless, Lt. Richardson was ordered to get a station on the air without delay.

Assignment: The Impossible

There is a familiar military motto which says: “The difficult we do immediately; the impossible takes a little longer.” Something of this sort must have been in Richardson’s mind when he started on this apparently “impossible” assignment. The first thing was to determine what assets they possessed, if any, which could be used to offset the all-too-evident liabilities.

He had plenty of money, practically the only item which could be sent in. There were telephone exchanges, telegraph stations and small power houses which contained equipment — some good, some wrecked, but all of which constituted a possible source of raw materials. By diligent inquiry he discovered an old UV-211 “50-watter” and a mica condenser, capacity unknown. Finally, they found a copy of The Radio Amateur’s Handbook, 1932 edition, which belonged to a chap who had been a telegraph operator for the Philippine Bureau of Posts. It was dog-eared and mouldy, and had beensampled by white ants; the cover was long since gone and someone had bound it together with wire — but the essential information, every bit of practical knowledge necessary to build and operate a radio station, was still there.

Using the available funds, they started out to buy as many radio sets as could be found. The first haul consisted of one RCA, one Philco, two Airline and one Phillips receiver — the latter a Dutch-built set. The Phillips and one of the Airline jobs seemed to be in the best condition. They were used as the receiver, one functioning as a b.f.o. to permit c.w. reception on the other. The remaining sets were dismantled for parts to make a transmitter. While this was going on, someone came up with a p.a. amplifier which contained a 200-watt transformer. Then someone else brought in the field coils from a wrecked generator, an almost inexhaustible source of No. 28 copper wire.

* 507 W. 62nd St., Chicago, Ill.
¹ To be published by Simon & Schuster.

QST for
Improvisation à la Handbook

Some of the details of that first rig are a little hazy, but the lieutenant can quote line and page from the Handbook on all the important points! They rewound the p.a. transformer with wire from the generator, insulating the layers with waxed paper which had been used as wrapping for dynamite. They wound six-layer r.f. chokes on glass tubes found in a drug store, using No. 30 d.c. taken from a telegraph relay. There was no coil dope available to hold the layers in place, so they used natural gutta percha obtained from the trees on the island. Tank coils were wound from No. 6 telephone wire.

The problem of a socket for the precious 211 was solved in similar rough-and-ready fashion. Old hard-rubber storage-battery jars were cut up for insulating material. The tube was wedged into place in a hole cut in one of the receiver chassis and spring contacts were made out of a brass nameplate taken from one of the telegraph relays. When these proved too flexible, broken hacksaw blades were used to add springiness. A 150-watt transformer from one of the larger BCL receivers was rewound to give a 12-volt filament supply.

When it came to a source of power for all this equipment, Richardson’s knowledge of gas engines paid big dividends. A great deal of the electrical equipment on Leyte was designed for 220-volt a.c. operation and a large Fairbanks-Morse gasoline-driven generator for that voltage was located. The engine was beyond repair, but the generator was still good and it didn’t take long to hook it up to a 2½-horsepower single-cylinder job, which was salvaged from a local farm. It was of the type with two enormous flywheels, hitting only once in every half-dozen revolutions after it gets up to speed, and had to be started on gasoline. Once under way, however, it performed very well on coconut oil. The main drawback was the lack of a muffler, for the exhaust from that big cylinder could be heard altogether too far for safety. This difficulty, unfortunately, was not covered in the Handbook.

It was finally solved by burying 30-odd feet of hollow bamboo tubing underground at random angles and running the exhaust through this “pipe.”

The finishing touches on this first transmitter included red and green pilot lights from the p.a. system to indicate when plate and filament voltages were on and a white lamp with a pick-up loop to show output. This radiation indicator burned out several times before they got it adjusted correctly, but fortunately there were plenty of spare bulbs.

When the rig first went on the air there was one other difficulty. The key had been inadvertently connected in the high-voltage lead, and they had to operate it with a long plastic-handled screwdriver for a few days until the reason for the “fireworks” was discovered.

No regular antenna wire was available but there was plenty of No. 24 enameled wire from another old field coil and a hand drill was pressed into service to twist together 17 strands of this wire.

Zepp spreaders were cut out of the hard-rubber battery cases and there were plenty of jungle trees to serve as “sky hooks.” The antenna was strung about 130 feet above ground and was oriented for maximum signal strength in the direction of Australia.

At about this point in the narrative we interrupted to remark that, of course, Lt. Richardson must at least have known the code before he ever undertook such a job. That turned out to be a bad guess on our part. It seems that the code was on page 30 of the Handbook — and it was just something else that had to be learned in between dodging Japs, building radio equipment, and conducting full-scale guerrilla warfare!

On the Air

When they finally got their first transmitter in good running order, it operated with an input of 85 watts. The plate supply was 940 volts of raw a.c. from the rewound transformer, and the note sounded like someone clearing his throat — but it did the trick.

As might be expected, all was not smooth sailing. The transformers were the principal source of trouble. That waxed dynamite-wrapping paper didn’t work out very well; it seemed to encourage moisture condensation, and they found that ordinary typewriter paper was better for the purpose. It wasn’t long before all hands became expert at detecting incipient burn-outs and doing a rewinding job in a hurry. In fact, they even invented a new “Q” signal to cover the situation:

QAB — My transformer is smoking. Please stand by for an hour.

With the first rig on the air and working successfully, it was time to expand the organization. The search for more broadcast receivers, prefer-
A Transmitter-Receiver for CAP-WERS Work

112-Mc. Gear for Light Aircraft

BY CAPT. ROBERT E. LATHROP,* CAP, EX-W9GOD

In this article the author describes the construction of a 6-tube transmitter-receiver for CAP-WERS plane-to-ground communication. The 2-tube transmitter is an m.o.p.a., with a linear output tank, while the receiver is a superregenerator with a tuned r.f. stage. The unit is compact and weighs less than 6 pounds.

The need for a light-weight 112-Mc. transmitter-receiver, with good frequency stability and low battery drain has existed ever since CAP was authorized to use WERS frequencies for flight and training missions. The author believes that the unit shown in the photographs not only fills this need but also will be able to carry on after the need for WERS is past. With the replacement of the self-excited oscillator by a crystal oscillator of proper frequency, this transmitter-receiver will be usable in the 130-Mc. band which is scheduled to replace the currently-used frequencies of 278 kc. and 3105 kc. Most large airports already are using v.h.f. equipment for airport-control purposes.

The transmitter-receiver and all accessories, including storage battery, weigh 29.1 lbs. The average light plane is equipped with a storage battery so the net added weight of the equipment will be only 13.2 lbs. A tabulation of individual weights is given here, since the average light plane often is allowed less than 50 lbs. for accessories and baggage.

<table>
<thead>
<tr>
<th>Weight Table</th>
<th>Lbs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit with tubes</td>
<td>5.25</td>
</tr>
<tr>
<td>Microphone and cable</td>
<td>0.81</td>
</tr>
<tr>
<td>Headphone and cable</td>
<td>0.25</td>
</tr>
<tr>
<td>Power supply and cable</td>
<td>5.14</td>
</tr>
<tr>
<td>Antenna and lead-in</td>
<td>0.75</td>
</tr>
<tr>
<td>Storage battery and case</td>
<td>13.30</td>
</tr>
<tr>
<td>Total</td>
<td>29.10</td>
</tr>
</tbody>
</table>

The total stand-by receiving "A" battery load is 4.1 amperes, increasing to 9.2 amperes while transmitting. With the 22-ampere-hour storage battery used, the equipment will operate satisfactorily for approximately 8 ½ hours before the battery voltage falls off sufficiently to cause unsatisfactory operation.

Circuit Details

Only two tubes are used in the m.o.p.a. which constitutes the r.f. part of the transmitter. One section of the 6C8G dual triode serves as a self-controlled oscillator operating at 19 Mc., while the other section is used as a frequency tripler to the 56-Mc. band. The output stage with a 7A4 doubles frequency to the 112-Mc. band.

Since there is seldom any need for changing the tuning of either transmitter or receiver, once they have been set to the proper operating frequencies all tuning adjustments are made by screwdriver. Thus only the knobs for regeneration and gain controls appear on the front panel.

The oscillator circuit is tuned to the proper frequency primarily by C1, and also by means of a machine screw in the field of L1 which serves as a tuning "slug" to alter the inductance of the coil. The transmitter output frequency charges about 10 kc. for each revolution of the screw.

A self-resonant coil is used in the plate circuit of the tripler stage. This circuit is adjusted by squeezing together or spreading out the turns of L4. Once the frequency is set for the middle of the band, no further adjustment is required.

A concentric-line tank, L4, is switched to serve as the plate tank for the 7A4 when transmitting or for the grid tank of the 9001 r.f. amplifier tube when receiving. Thus it is not necessary to switch the antenna when changing over from transmitting to receiving, the antenna being permanently coupled to the tank by means of the hairpin loop, L7.

When the concentric tank is switched over for receiving, the additional tuning...
are chosen. Quenching voltage is introduced in the screen circuit of the detector.

level, and the sensitivity of the detector can be made equal of the usual self-quenching detector if the proper quenching voltage and frequency are chosen. Quenching voltage is introduced in the screen circuit of the detector.

Several of these receivers have been in use for a period of over two months without retuning and all are still "on the button."

Audio Section

One section of the 7F7 dual triode which follows the detector is used as a separate quenching oscillator, while the other section serves as the first audio amplifier. The separate quenching oscillator results in better stability and a lower hiss level, and the sensitivity of the detector can be made equal of the usual self-quenching detector if the proper quenching voltage and frequency are chosen. Quenching voltage is introduced in the screen circuit of the detector.

The audio section of the 7F7 is operated at zero bias and is transformer coupled to the 41 output stage. This stage is operated at reduced plate voltage for receiving. Two stages of audio are necessary, since "prop" and engine noises usually are sufficient to cover a lower-level a.f. which may seem to be entirely adequate in the quiet surroundings of a test bench. The output of the 41 is impedance-capacity coupled, by means of 

\[
L_9 \quad \text{and} \quad C_{22}, \quad \text{primary and secondary connected in series.}
\]

\[
R_{22} \quad \text{and} \quad C_{22}, \quad \text{connected in series.}
\]

\[
L_9 \quad \text{and} \quad C_{22}, \quad \text{connected in series.}
\]

\[
R_{22} \quad \text{and} \quad C_{22}, \quad \text{connected in series.}
\]

The change-over switch, \( S_2 \), is operated by the solenoid, \( L_{19} \). If electrical operation is not deemed necessary, it may be operated by a push rod from the front of the panel, as shown in the sketch of Fig. 2. The latter arrangement has the disadvantage that two hands are required unless a throat microphone is used.

\[
L_{10} \quad \text{and} \quad C_{22}, \quad \text{connected in series.}
\]

The change-over switch, \( S_1 \), is operated by the solenoid, \( L_{19} \). If electrical operation is not deemed necessary, it may be operated by a push rod from the front of the panel, as shown in the sketch of Fig. 2. The latter arrangement has the disadvantage that two hands are required unless a throat microphone is used.

\[
C_{19} \quad \text{and} \quad C_{22}, \quad \text{connected in series.}
\]

\[
R_{22} \quad \text{and} \quad C_{22}, \quad \text{connected in series.}
\]

\[
L_{19} \quad \text{and} \quad C_{22}, \quad \text{connected in series.}
\]
Construction

The over-all dimensions of the unit are 7½ inches high, 7¼ inches wide and 5¾ inches deep. For lightness, the case and chassis are made of sheet aluminum. Looking from the rear, the transmitter occupies the left-hand side of the chassis while most of the receiver components are mounted on the right side with a vertical shield separating the two sections. The parts for both are laid out so as to keep all connecting leads as short as possible. With the exception of the grid and plate leads to the master-oscillator tube, none is over 1½ inches long. The oscillator grid and plate coils, $L_1$ and $L_2$, are wound on a piece of half-inch polystyrene rod ½ inch long. $L_2$ is wound between the spaced turns of $L$. While other means may be preferred by the individual constructor, in this case it was convenient to mount the coil form on the ceramic base of $C_1$. This was done by the use of a brass sleeve or bushing ¾ inch long threaded ¼-inch-28 on the outside and 6-32 on the inside. This sleeve was threaded into the “ground” end of the polystyrene rod with sufficient length left protruding so that it could be mounted on the condenser base with a ½-inch brass nut. A 6-32 brass machine screw threaded into the brass sleeve and fitted with a locknut serves as the tuning slug for tuning the coil. The assembly of condenser and coil is mounted in the lower left-hand corner of the panel where the adjusting screws protrude through clearance holes to the front. The 608G is mounted directly behind this assembly, the triode section whose grid connection is made to the cap on top of the tube being used as the oscillator. The self-supporting tripler plate coil, $L_3$, is fastened to a strip of polystyrene mounted underneath the chassis alongside the socket of the 6C8G.

The 7A4 output tube can be seen adjacent to the concentric-line tank. The outer conductor or “can” of this tank consists of a sheet of 0.028-inch copper sheet rolled into the form of a 2-inch cylinder 6½ inches long (with the aid of the junior op’s baseball bat). The inner conductor, which may be made from a 6½-inch length of ½-inch copper tubing or No. 8 wire, is soldered directly to the stator of $C_1$, which is mounted on the front panel so that the inner conductor is central in respect to the outer “can.” Incidentally, this tank is mounted in a position inverted to that shown in the diagram of Fig. 1, with the high-potential end at the chassis level.

The antenna-coupling loop, $L_7$, is a piece of No. 14 insulated hook-up wire 3½ inches long bent in the shape of an L, one end of which is soldered to the top or “ground” end of the cylinder, ½ inch from the center conductor. Two and a half inches of the length is run parallel to the center conductor while the balance is brought out through a ½-inch clearance hole to the antenna post on the panel.

Those details of construction which cannot be seen clearly in the photographs may be determined from an examination of the sketch of Fig. 2. The 9001 r.f. amplifier-tube socket is mounted with its grid terminal an inch or so from the tank. Ground connections for $C_{10}$ and $C_{11}$, as well as all other ground connections shown for the 7A4 and 9001 r.f. stages are made directly to the outside conductor of the tank and not to the chassis.

The 9001 superregenerative detector tube is mounted near the right-hand edge of the chassis (rear view). The r.f. transformer consisting of $L_6$ and $L_8$ is mounted underneath between the sockets of the two 9001 tubes. These two coils are wound on a 1½-inch length of ½-inch polystyrene rod which is threaded to take a 6-32 mounting screw at one end and another 6-32 with the head cut off at the other end. This latter serves as a tuning slug which may be turned by a piece of...
¼-inch polystyrene rod extending through the front of the panel. The form is fastened in a horizontal position to a brass post which spaces it from the chassis. \(L_9\) is wound between the turns of \(L_8\) and both windings should be given a coat of low-loss coil cement. \(C_{10}\) should be mounted as close as possible to the detector tube since it serves not only to control the quench frequency but also as an r.f. by-pass for the detector screen.

The 7F7 is mounted on the receiver side of the vertical shield near the rear edge of the chassis with the audio choke, \(L_8\), between the 7F7 and the 9001 detector tube. This audio choke actually is a midget interstage transformer with primary and secondary windings connected in series.

The quench coils comprising \(T_2\) may be made, if desired, by turning two slots ¼ inch apart in a piece of broomstick. The plate-coil slot should be ½ inch wide and ¼ inch deep, while the slot for the grid coil is ¼ inch by ¼ inch. Both slots should be wound full with No. 34 or No. 36 enameled wire. The windings should be kept even so that the slots will accommodate as many turns as possible.

The combination microphone and audio transformer, \(T_1\), is mounted on the vertical shield immediately below the microphone battery. This also is a midget interstage transformer with an added microphone winding of 50 to 100 turns of No. 30 d.c.c. wire placed over the original windings. If space is not available, the core may be filed down slightly to provide a space of about ½ inch for the additional winding. After the winding has been completed, the leads should be anchored with two layers of cellulose Scotch tape and the winding given a coat of coil dope.

The output choke, \(L_9\), and the 41 output tube occupy the rear left-hand corner of the chassis.

Details of the homemade change-over switch may be seen best in the sketch of Fig. 2. It consists principally of two bars of Plexiglass made from 6-inch feeder spreaders, on which are mounted jaw-type contacts obtained from a discarded band switch. Contacts of this type are used to escape noise under vibration. One of the bars is mounted in a fixed position while the other is permitted to slide back and forth. The r.f. end of the switch is adjacent to the coaxial tank, the a.f. contacts are at the rear and the power contacts in the center. The switch is operated by a lever system from a solenoid, \(L_{10}\), located in back of the concentric tank on the transmitter side of the vertical shield. The lever operates through a slot cut in the chassis as indicated in Fig. 2. The solenoid plunger is a piece of ½-inch soft-iron rod 2 inches long which slides inside a thin-wall brass tube on which 360 turns of No. 22 enameled wire are wound. The coil is 1¾ inches long.

The unit is designed so that either dry batteries or a vibrator pack may be used to operate it. If batteries are used, a voltage of 90 to 100 is applied to the receiver and 135 to the transmitting section. When the vibrator pack is used, a 20,000-ohm 10-watt resistor is placed in series with the 100-volt lead. This resistance is installed in the vibrator-pack unit and, in conjunction with \(C_{25}\), serves to provide additional filtering as well as to drop the voltage to the desired value.

**Adjustment**

In tuning up the transmitter, a test loop consisting of 2 turns of hook-up wire, ½ inch in diameter, with a 2-volt 60-ma. dial lamp in series will be found useful. The oscillator is tuned to one sixth of the desired carrier frequency. If it is working properly, the plate current will be 20 ma. and the lamp in the test loop will light to the correct degree.

![Bottom view of the CAP-WERS transmitter-receiver. The high-potential end of the concentric tank is just to the right of center, near the bottom edge, with \(C_5\) at its center. To the extreme right is \(C_{15}\), with \(C_{10}\) between. \(L_8\) is clearly visible at the upper left.](image-url)
full brilliance with moderate coupling. The tripler plate coil, $L_3$, is best adjusted by checking the grid current to the 7A4 with a 0–1 milliammeter connected in series with $R_4$ at the ground end. When the size of $L_3$ has been adjusted correctly by changing the spacing between turns, the grid current should be about 350 microamperes and the tripler plate current about 8 ma. The output of the tripler should be checked with an absorption-type frequency meter to make sure that it is tripling.

The final-amplifier tank is then tuned for maximum output, using a 60-ma. dial lamp as a dummy load. The plates of $C_8$ will be about one-third meshed. The tuning of this circuit is sharp and will not be changed much with antenna loading. With the 7A4 operating at 240 volts, the loaded plate current should be about 8 ma. and the power output approximately $\frac{1}{4}$ watt. With no modulation, the load lamp should light above normal brilliance.

If the transmitter is functioning properly, no trouble should be experienced in obtaining upward modulation with excellent frequency stability and very little carrier shift. The plate efficiency of the final cannot be expected to be remarkable since this stage is doubling frequency, but the signal sounds sweet on a converter-IIRO. Efficiency of the final cannot be expected to be normal brilliance.

A word about the sensitivity of v.h.f. receivers may be in order at this point. If the sensitivity is good, QRM from the average automobile or unshielded aircraft ignition system will be heard at distances up to 500 feet. If the noise pulses from the ignition system of your own ship are very strong, the superregenerative receiver will automatically decrease its sensitivity and you may kid yourself that you don’t have ignition noise. Under these conditions the sensitivity of the receiver may be reduced to the point where a range of 5 to 10 miles will be maximum.

**Antennas**

Two types of antennas have been employed with good results. One type consists of a vertical dipole supported by Q bars, fed with a 400-ohm open-wire line. The Q matching section is fastened to a piece of plywood which, in turn, is attached to the jury wing struts. The short open-wire line, made up of No. 16 wire, is run through small holes in the pyralin cabin wall to the antenna. The pyralin should be reinforced with additional pieces cemented in place wherever holes are made. Also the lead-in should be brought in at a point where it will place the least strain on the window.

The second type of antenna, used on metal-covered ships, consists of a quarter- or half-wave vertical antenna fed by a short coaxial line. The half-wave antenna is preferable, since it also may be used on the 200- to 400-ke. aircraft range receiver. Mounting of this antenna on this type of ship must be done by an A and E mechanic, since holes must be made in the skin of the ship.

**Installation**

WERS installations on aircraft present several problems. CAA requires that any structural alteration or change in weight in an aircraft caused by the installation of radio equipment, including antennas, radio units, batteries, generators, etc., must be done by a licensed A and E mechanic or under his supervision. After this has been done, the aircraft must be inspected and relicensed by a CAA inspector.

However, CAP-WERS stations have been given some leeway in this matter. Antenna systems are made permanent installations and the ship relicensed by compliance with CAA Repair or Alteration Form 337. A temporary radio installation then may be held in the lap of the observer or strapped down in the baggage compartment, during CAP flights and missions or for test flights. Permanent installations of CAP-WERS equipment in aircraft, outside of antennas, are not made since WERS and CAP rules forbid the installation of this type of radio equipment where it is not at all times under the supervision and control of the licensee or his communication officers. Also the CAA rules forbid the removal of radio equipment after it has been installed and the ship relicensed to carry the additional weight of the equipment, unless Form 337 re-inspection rules are complied with. In simple language, CAP-WERS radio equipment is considered as baggage, and so long as the baggage or passenger-weight restrictions are complied with, no trouble will be encountered. As a last word of caution, be sure that cables or microphone and headphone cords do not interfere with the operation of the aircraft controls and throttle, or interfere in any way with

The author and the XYL ready to take off with the CAP-WERS installation.

QST for
the pilot's vision or operation of the aircraft. Safety is most important.

**Performance**

Several units built along the lines described have given good results up to 30 or 40 miles under adverse conditions at an altitude of 600 to 1000 feet. At a 3000-foot altitude distances up to 60 miles may be expected. We have heard some Chicago units at a distance of approximately 95 miles while flying at 3000 feet. The CAP ground-station equipment makes use of a coaxial antenna 15 feet above ground. The transmitter is a crystal-controlled 815 job with 15 watt output, while the receiver is a superhet per QST, July, 1944, page 15, with 9002 tubes in place of the 955s and a separate quench oscillator added.

Three of these units have been under observation over a period of four months and the maximum frequency deviation observed to date has been under 0.03 per cent. This degree of stability makes it possible for a plane to take off from the home airport and establish communication with another airport ground station, 20 to 30 miles away, as soon as it has reached an altitude of 600 to 1000 feet—without the necessity for long calls or for the ground-station operators to continuously dial across the band.

In Wisconsin all CAP communication is on 115,500 kc. plus or minus 50 kc. Each Group has a home-built frequency meter which is accurate to within 0.01 per cent for normal temperature variations (50 to 90°F.). If abnormal temperatures are experienced, a temperature correction can be made which will bring the net accuracy to within 0.03 per cent.

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**SPLATTER**

**OUR COVER**

Depicting surroundings in which not a few hams find themselves these days, this is a view of a typical radio assembly and repair bench in a Quonset hut at an overseas U. S. Army depot. The ruggedly built gear procured by the Signal Corps is more often broken up by enemy action than broken down by parts failures, but when replacements or adjustments are in order well-equipped repair shops and skilled maintenance men speedily restore it to service.

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**FOOTNOTES**

The first of the several new QST contributors to be presented in these biographical sketches is S/Sgt. R. Bickmore, W6QDV (p. 11). In response to our plea for pertinent personal data, he writes: "Received my ham license in June, 1938, at the age of 14... Class-A and first class commercial tickets obtained March, 1941... Operated on all bands but spent most of my time on 14 and 112 Mc... While attending University of California—majoring in EE—operated KALW, the net’s first f.m. broadcasting station... Entered the U. S. AAF in February, 1943... Became communications inspector and later communications chief of Headquarters Squadron, First Fighter Command... Transferred to present station in October, 1944, as communications chief..." Which is a very nice array of data indeed—and to culminate it we call your attention to the fact that W6QDV is now only 21 years old...

Each appearance of these notes seems to contain the story of at least one old-time ham dating back to the era of the Wm. J. Duck and E. I. Co. catalogs. The old-timer for this issue is Robert E. Lathrop ex-9ATX-W9GOD, (p. 24). His life-story sounds like that of the composite ham. Starting at the age of ten with the gift of a spark coil from a neighbor’s attic, Lathrop advanced through the usual Century buzzer era to a Grebe tuner and a quarter-kw. with a rotary gap. By 1923 the spark had given way to c.w., but soon Lathrop was attending Carroll College and was able to operate 9ATX only on week-ends. While at the University of Wisconsin—on a scholarship, incidentally—his license lapsed. Along about 1930 a new call, W9GOD, was acquired and again Lathrop passed through the normal phases of ham radio including membership in ROWH and a Class A ticket. Eventually he wandered off into another fascinating hobby, that of private flying. Now a captain in the CAP and the Wisconsin Wing’s communications officer, Lathrop currently manages the time to design and construct radio gear for WERS-CAP installations as well as to fly his own Cub... The radio activities of Harvey Pol­lack, W2HDL (p. 18), appear to have centered mostly around educational work of one form or another. First licensed in 1932, W2HDL started on 80-meter c.w. and stuck to that for two years. Twenty-meter ‘phone then claimed — and held — his interest for the next seven years, until the war. For a time Harvey taught physics, also supervising radio clubs and societies in the New York school system. Following this came a period as chief instructor in radio at Melville Aeronautical Radio School. Harvey then joined the engineering staff of the Panoramic Radio Corporation, where he is now in charge of technical literature and specifications. However, just to keep his hand in, he is also teaching evening radio classes at Hunter College. Sometime during the past two years W2HDL somehow found time to get his master’s degree in physics at Columbia. Perhaps the strong bond between the educational and radio activities of W2HDL arose when, on graduating from Brooklyn College with A.B. in physics, he took examinations for a teaching post. While awaiting results, he and a friend went on a camping trip in upper New York state. He took along a portable and skeds were arranged with a neighbor-ham at home. On one of these schedules word came from his mother that he was to report at once as an instructor at De Witt Clinton High

(Continued on page 104)

March 1945 29
IN THE SERVICES

Apologetics to amateurs in Civil Service and 100 per cent war industries, who have sent us their AWSRs and have not yet seen their names listed in these pages. Registrations from men in the armed services, to whom we give preference, continue at a high level, and the available space in QST has been insufficient to take care of all other categories promptly. Have patience, fellows. We appreciate your registrations, and every one of you will be listed just as soon as possible.

MARINE CORPS

2LAV, Boesiger, T/Sgt., foreign duty
2NAS, James, Pfc., Walnut Ridge, Ark.
3JWB, Cotulla, Sgt., Grove City, Pa.
4FXV, Kiss, Pvt., Camp Lejeune, N. C.
4HUP, Paris, Cpl., San Diego, Calif.
ex-SAY, Cisler, Capt., foreign duty
5FXV, Jefferson, S/Sgt., Hudson, Wis.
6LUG, Moehlman, Pvt., foreign duty
6FBI, Verge, 2nd Lt., Quantico, Va.
6FUV, Weiske, Pvt., Camp Lejeune, N. C.
6TPF, Riddell, Pvt., Corpus Christi, Texas
6TRP, McDaid, Pvt., San Diego, Calif.
6ZGO, Mitchell, Capt., foreign duty
ex-7FEB, Anderson, Pvt., Grove City, Pa.
8FPE, Blackshear, 2nd Lt., Cambridge, Mass.
8UQO, Qalambos, Cpl., Camp Gordon John-
town, Ga.
8VQG, Hager, 1st Lt., St. Louis, Mo.

Operator’s license only:

Samberg, MT/Sgt., Brooklyn, N. Y.

ARMY—SIGNAL CORPS

ex-1BLO, Gaussont, Pvt., foreign duty
KAIC, Slinker, Capt., foreign duty
1DYK, Nilson, Capt., Leavenworth, Kan.
1OAF, Perry, T Sgt., foreign duty
1JFT, Creswell, Lt., foreign duty
1KUY, Hirst, Capt., foreign duty
1KUL, Broom, T Sgt., foreign duty
1NOO, Burdick, Capt., foreign duty
ex-2AGB, Murray, Capt., foreign duty
2BD, Hogencamp, Major, foreign duty
2HII, Kohler, Lt., foreign duty
2LQB, Bunnell, Sgt., foreign duty
2MGT, Geaumont, T/Sgt., Camp Kohler, Calif.
2MTO, Zinda, Pvt., foreign duty
2OA, Ellis, 2nd Lt., Baltimore, Md.
2OEL, Widmann, Cpl., Ft. Jackson, S. C.
2TGP, Marie, 1st Lt., foreign duty
3FD, Hanes, T/Sgt., foreign duty
3FNP, Meyer, Sgt., foreign duty
3FPD, Logan, Capt., foreign duty
4FPL, Beeder, Lt., Warrenton, Va.
4TVD, Reid, T/Sgt., foreign duty
4GSO, Apple, Pvt., Ft. Monmouth, N. J.
4HEX, Lay, Sgt., foreign duty
4IEC, James, Sgt., foreign duty
4S22, Butsk, Cpl., Long Island City, N. Y.
4S24, Glendenning, Lt., foreign duty
4TBT, Gregory, S/Sgt., foreign duty
4TVG, Ford, Pvt., Camp Crowder, Mo.
6BIZ, Brizzarino, Cpl., Sam Maleo, Calif.
ex-6EGO, Leonard, Lt., foreign duty
6IPG, Ferguson, T Sgt., foreign duty
6IQO, Weathers, T/Sgt., foreign duty
6IKO, McDonald, Pvt., foreign duty
6JDF, Blomsness, T/Sgt., Seattle, Wash.
6TID, Amsden, T/Sgt., foreign duty
6TLM, Strong, T/Sgt., Seattle, Wash.
6TIXS, Arnold, Sgt., foreign duty
7IAO, Tomizer, T/Sgt., foreign duty
7AAP, Granado, Cpl., Baltimore, Md.
8IKO, Crompton, T/Sgt., foreign duty
8IEO, Warner, N., foreign duty
8UQO, Stewart, T/Sgt., foreign duty
8R92, Slater, T/Sgt., La Plata, Md.
8SXM, Rupert, Cpl., foreign duty
8T92, Swink, T/Sgt., foreign duty
8T97, Tynes, address unknown
8T98, Carrera, Sgt., foreign duty
8UBF, Paunovik, T/Sgt., foreign duty

Many amateurs will remember Capt. Cecil I. Slinker (right), who operated KAICS in the Philippines during 1936 and 1937. Called to active duty in 1941, he is now serving as signal officer with a Y-Force liaison team attached to a Chinese division. Y-Force is the American military mission which trained and equipped the Chinese Expeditionary Force for the Salween campaign in Western Yunnan. Official U. S. Army Signal Corps Photograph.

8UWE, Steiner, Lt., Cambridge, Mass.
8W7W, Moody, S/Sgt., foreign duty
8CUL, Cook, Cpl., foreign duty
8W00, Gedich, Sgt., foreign duty
8X9, Amer, Cpl., foreign duty
ex-9BIM, Waner, Major, foreign duty
9EED, Kleppner, 2nd Lt., Long Branch, N. J.
9D88, Strawbridge, Capt., foreign duty
9HUK, Kramer, Pvt., foreign duty
9JOI, Slawson, Lt., foreign duty
9JBE, Warden, T/Sgt., Camp Crowder, Mo.
9MV, Foote, Pvt., foreign duty
9KXW, Wesley, 2nd Lt., Ft. Pomme, N. J.
9KBR, Elder, address unknown
9MDV, Tipton, Sgt., Chicago, Ill.
9MNO, Casey, Cpl., foreign duty
9MTD, Bolling, Capt., foreign duty
9NCO, Stokes, Cpl., foreign duty
9OR, Arthur, T/Sgt., foreign duty
9QVL, Nos, T/Sgt., Long Branch, N. J.
9RNO, Pudzich, Pvt., Camp Crowder, Mo.
9TIN, Bendall, Lt., foreign duty
9TPD, Quinn, Pvt., Brooklyn, N. Y.
9WIK, Campbell, Lt., Tuskegee, Ala.
ex-9YSS, Schmann, 2nd Lt., foreign duty
9YTO, Juring, T/Sgt., Camp Crowder, Mo.
9YTO, Juring, T/Sgt., foreign duty

Operator’s license only:

Brush, Cpl., foreign duty
Carabassett, Pvt., Presidio, San Francisco, Calif.

EROPLING, Sgt., foreign duty
Jaksela, 2nd Lt., foreign duty
Levis, Capt., foreign duty
Levis, Capt., foreign duty
Ordine, 8/Sgt., foreign duty
Olsen, T/Sgt., foreign duty
Palm, T/Sgt., foreign duty
Porter, Lt., Ft. Monmouth, N. J.
Province, Maj., Ft. Myers, Fla.
Ross, Capt., Ft. Monmouth, N. J.
Sullivan, S/Sgt., foreign duty
Temple, Lt., foreign duty
Vaughn, Pvt., Ft. Monmouth, N. J.
Werner, Sgt., foreign duty
Walace, T/Sgt., Evanston, Ill.

NAVY—SPECIAL DUTY

1MGW, Hart, Ste, College Station, Texas
2LTE, Nolan, CRT, Portland, Me.
2NSU, Nakash, CRT, foreign duty
3EQO, Kellam, RT1c, address unknown
3FXK, Schermerhorn, CRT, Berkeley, D. C.
3IQO, Resch, CRT, foreign duty
4H77, Jull, Rt. T2c, Houston, Texas
4JC, Pritchett, RT1c, Chicago, Ill.
4JU, Sanders, Rt. T1c, address unknown
5KQW, Hankins, RT2c, Oceanside, Calif.
5KRC, Andrus, RT2c, Tujunga, Calif.
6RE, Gandy, RT1c, foreign duty
6QVY, Jansen, RT2c, Chicago, Ill.
6RNN, Tanner, Lt., Chicago, Ill.
6TQP, Reynolds, CRT, foreign duty
7DJF, Alfred, RT2c, Chicago, Ill.
7L8X, Bobbitt, RT2c, Chicago, Ill.
8LTV, Bolvin, RT2c, Chicago, Ill.
8NNX, Matvay, RT1c, foreign duty
8PH, Marshall, RT1c, Chicago, Ill.
8SYO, Custer, RT2c, Chicago, Ill.
8U89, Naumann, Ste, Chicago, Ill.
8V50, Narad, RT1c, foreign duty
8WOX, Rohle, RT3c, foreign duty
8WVJ, Dundas, Ste, Great Lakes, Ill.
9HIH, Parkin, RT1c, Oceanside, Calif.
9JN5, Brinkman, Ste, Stillwater, Ohio.
9KZD, Dene, RT1c, Chicago, Ill.
9MMA, Leist, RT3c, Chicago, Ill.

Operator’s license only:

Bell, Ste, Greensville, Pa.
Pomplin, Ste, Del Monte, Calif.
Rusta, RT1c, foreign duty
Rupert, RM/Sgt., Great Lakes, Ill.
Scheermeyer, Ste, Del Monte, Calif.

QST for
ARMY - AIR FORCES

ex-1TD, Tussey, Lt., foreign duty

1KF, Kasan, Lt., Algiers, Algeria

1LW, Karst, Capt., foreign duty

2TH, Lefee, Capt., foreign duty

4TH, Hutton, Col., Arlington Field, Va.

7TH, Lavoie, Lt., St. Paul, Minn.

11TH, Peter, Maj., foreign duty

15TH, Bell, Lt., foreign duty

18TH, Hogsett, Capt., foreign duty

62TH, Adams, Capt., foreign duty

73TH, Fash, Capt., foreign duty

107TH, Jones, Capt., foreign duty

137TH, Olin, Capt., foreign duty

209TH, Kern, 1st Lt., foreign duty

ARMY - GENERAL

1ST, Brady, Pvt., Ft. Knox, Ky.

51ST, MacDonald, S/Sgt., foreign duty

202ND, Criner, Lt., Camp Gordon, Ga.

275TH, Hendrickson, Cpl., Aberdeen Proving Grounds, Md.

309TH, Blue, Pvt., foreign duty

401ST, Mattingly, Capt., foreign duty

509TH, Waits, Sgt, foreign duty

600TH, McCarty, T/Sgt., foreign duty

SAM, Surgical, foreign duty

ARMY - AERONAUTICS

30FG, McNamara, Lt., Washington, D. C.

49FG, Sorensen, Capt., Corpus Christi, Texas

50FG, Meredith, A/2C, foreign duty

75FG, Adams, ARM1e, Norfolk, Va.

15TH, Rogers, Lt. (jg), Bedford, Mass.

90TH, LeNort, A/Tt, foreign duty

710TH, Fitcher, A/2C, foreign duty

8TH, Kelly, A/3C, foreign duty

85TH, Anderson, Lt. (jg), Annapolis, Md.

90TH, Shultz, Capt., foreign duty

710TH, M mitcher, Lt., Corpus Christi, Texas

800TH, Glackin, ART2c, foreign duty

30Y, Klett, Lt., Atlantic City, N. J.

310TH, Sellers, Lt. (jg), Lake City, Fla.

39TH, Matthews, Cpl., Corpus Christi, Texas

90TH, Merrick, Lt., Atlantic City, N. J.

90TH, Tattle, A/T, Seattle, Wash.

90TH, Cox, Lt., Patuxent River, Md.

90TH, Wagner, Lt., Sacramento, Calif.

Operator’s license only:

Benst, Sgt., Corpus Christi, Texas

Grant, ART1c, Washington, D. C.

Jeney, ARM1e, foreign duty

Kost, Lt., Del Mar, Calif.

NAVY - AERONAUTICS

3FG, O’Connor, Capt., foreign duty

5FG, Shackelford, S/Sgt., foreign duty

7FG, Maloney, Capt., foreign duty

10FG, Gray, S/Sgt., foreign duty

26FG, Allen, S/Sgt., foreign duty

62FG, Marshall, Capt., foreign duty

73FG, Curtis, Capt., foreign duty

107FG, Smith, Capt., foreign duty

137FG, Smith, Capt., foreign duty

209FG, Kern, 1st Lt., foreign duty

275FG, Hendrickson, Cpl., Aberdeen Proving Grounds, Md.

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73FG, Curtis, Capt., foreign duty

107FG, Smith, Capt., foreign duty

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309TH, Blue, Pvt., foreign duty

401ST, Mattingly, Capt., foreign duty

509TH, Waits, Sgt, foreign duty

600TH, McCarty, T/Sgt., foreign duty

SAM, Surgical, foreign duty

March 1945
MERCHANT MARINE AND MARITIME SERVICE

**Do you have in the MM and MS want each listing to be one line, giving call, name and steampship company? For reasons of security your vessel cannot be named, but we'll be glad to use the alternative form if you will send us the information. Of eighty-one men listed this month, only fourteen gave the name of the steampship company, the remainder the name of the vessel, home address or no address. Send us full information and we will do the rest.**

**Lt. (jg) George Zimmerman, USNR, W2ZW, is a member of the “splinter fleet.” His ship was one of the few U.S. minesweepers detailed to clear mines from the approaches to the Pacific coast. Dredging shells from Nazi shore batteries, its vessel and he complement had a grandstand seat for the main show. Read his “Hans in Combat” story on page 48 in this issue for a swell yarn.**

**100 PER CENT WAR WORK—INDUSTRY**

**General Electric Co.**

1ED, Januila, Bridgeport, Conn.
1HOD, Webb, Hudyke, Mass.
1JWT, Downs, Bridgeport, Conn.
19US, Allen, Bridgeport, Conn.
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<tr>
<td>2MGR</td>
<td>Graubard</td>
<td>Greenwich, Conn.</td>
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**CANADA**

OMs: we're giving you our all from Canada this month. The list is awfully small but we can't invent registrations to pad your section of the ITS column. Won't you make it a matter of personal pride to send us calls, names, ranks or grades, military or civil addresses and branch of the service or war industry of yourself and your buddies? Your government will want to know Canadian amateur participation in the war effort when postwar frequencies are handed out and the value of ham radio to your country is under consideration.

**RAF**

3AYJ, Patterson, F/L, Gander Field, Newfoundland
ex-3FI, Stevens, F/Sgt., Yarmouth, N. S.
3JR, Rennie, Forfar, Ohio
4EP, Read, Glensideville, Alberta
4BQ, Hallock, F/O, Patricia Bay, B. C.

**RAF**

2IL, McQuillen, R/O, foreign duty
3AXF, Postel, R/O, Dorval, Que.

**RCCS**

3AM, Dingle, 2nd Lt., Ottawa, Ont.
3AXM, Brant, Capt., foreign duty
3TO, Cooper, Sgt., Ottawa, Ont.
3RB, Harrison, QMS, Britannia Hts., Ont.
3MQ, Cooke, Lt., Woodroffe, Ont.
4AAD, Freeman, Capt., Calgary, Alberta
ex-4AUO, Koplos, Sigma, Windsor, N. S.
4GH, Newell, Sgt., Winnipeg, Manitoba
ex-5DB, Watson, Lt., Ottawa, Ont.
5Y/1, Edwards, 2nd Lt., Barriefield, Ont.

**RCN**

3TB, Collins, W/O, St. Johns, Newfoundland
3RX, Williams, C/O, Toronto, Ont.
4AW, Goodridge, Ord. Seaman, St. John, N. B.
4ALS, Herts, T/O, R.O., Chelsea, Que.
4ALY, Huska, Ord. Seaman, St. John, N. B.

Operator's license only:
Jones, T/O, St. Johns, Newfoundland

**WRCNS**

Operator's license only:
Ramsay, Ottawa, Ont.

**MERCHANT MARINE**

5AKX, Warren, C/O, address unknown
5MD, Wood, R/O, address unknown

**CIVIL SERVICE**

1AS, Cunningham, Ottawa, Ont.
1AX, Elston, address unknown
5AB, Brunel, Ottawa, Ont.
5AML, Brookes, R/O, foreign duty
5AL, Copus, Capt., foreign duty
5QG, Patterson, Ottawa, Ont.
5AX, Brunei, Ottawa, Ont.
5SC, Harker, Vancouver, B. C.

**100 PER CENT WAR WORK—INDUSTRY**

3AKG, Ravenescoft, Ottawa, Ont.
5BH, Hulds, Ottawa, Ont.

Now two and a half years overseas, William H. Stull, W3GTS, was recently promoted to major, AAF, on the long road from private to general. He doesn't like the weather where he is (who does, regardless where?) and misses ham radio, but claims he still can flick a bug at 50 per. 

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March 1945

33
A Compact V.F.O. With Stable Output

**Sturdy Construction Makes the Typical Exciter Unit Useful in the Laboratory or Shop**

**BY ARTHUR H. LYNCH,* W2DKJ, AND THOMAS GOODWIN,** W2JTK

One of these days, hams will be back on the air. If the old rig needs only a little dusting off before firing it up, well and good. If a little rebuilding is required, however, here is a variable-frequency oscillator with design and constructional features which may help the prospective builder to plan a unit to fit his particular requirements.

In pre-Pearl Harbor days, variable-frequency oscillators were gaining rapidly in popularity because of their complete and rapid frequency coverage. Crystal oscillators, however stable, are tied to fixed locations in the spectrum. This is a drawback in amateur operating, since stations are not assigned specific frequencies. The rumored cheapness of crystals after the war may serve to alter this trend somewhat, but it is still questionable whether a large number of crystals and a selector switch make the operating problem much easier for the operator, compared to the turning of one dial of a v.f.o. to any desired spot in a given frequency band.

The rig here described has enough punch to excite the final stages of any average ham transmitter, and with proper adjustment its stability can, for all practical purposes, be made to approach that of crystal control. While we wait for the good old days to return, an outfit of this type is a big help around the lab or shop in connection with alignment or calibration jobs and various kinds of experiments.

---

**The Circuit**

In order that the advantages of a v.f.o. may be realized, the circuit for this rig, shown in Fig. 1, is designed mainly to give convenience of operation and stability of output. In this particular outfit, the author was contented with output in the 3.5-Mc. band, so the plug-in feature was not exploited. The oscillator “perks” in the 1.75-Mc. band, is amplified at the same frequency by the 6J7 buffer, and doubling into the 3.5-Mc. band is done in the 6V6G stage.

Only one dial and two switches are shown in the front-view photograph. The dial controls C1, C11, and C22 simultaneously through a cable-driven system which is visible in the top-view photograph. One of the toggle switches, S1, controls the 115-volt a.c. current, while the other, S2, allows the plate and screen voltages to be turned on or off without turning off the tube heaters. The jack, J, is located underneath the dial, and is connected in series with the 6V6G final-amplifier cathode either for keying or metering purposes. The unit, therefore, is single-dial controlled, with all other controls only incidental to its operation, so that convenience of operation is assured. Condensers C18 and C28 are trimmers across the main tuning condensers, but once they are set, they need not again be adjusted.

The oscillator of this rig is designed for stability through the use of a 6A8 tube in the modified e.c.o. circuit described in detail by Metcalf in QST for May, 1941.\(^1\) This circuit eliminates the cathode tap from the tuning inductance and thereby removes the changing cathode-to-heater capacitance from across part of the coil. Frequency stability thus is improved and, at the same time, there is no critical tap adjustment to bother with.

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Front view of the v.f.o. unit showing the vernier tuning dial, with the jack for a key or milliammeter underneath, and power-supply control switches on either side. Photographs by Stanley P. McMinn, W2WFD.
The possibility of hum or roughness in note which often is experienced with the conventional e.c.o. circuit, also is removed by placing the cathode at ground potential. In so doing, the variable condenser, \( C_1 \), is made "hot," so far as d.c. is concerned, but this objection is overcome easily by the use of stand-off insulators and an insulated flexible shaft coupling. Temperature changes affect stability, but compensation for these effects are made with \( C_6 \), which is a negative-coefficient pigtail-type condenser of a few microfarads capacity. High capacity in the tank circuit is achieved by adding the 500-µfd. mica condenser, \( C_2 \), in parallel with \( C_1 \) and \( C_6 \).

Plenty of output signal is provided with inductive coupling between \( L_4 \) and the plate tank coil, \( L_5 \); and the signal may be led to a desired point through a flexible low-impedance coaxial line screwed onto the connector indicated in Fig. 1. The power supply is included in the unit. The two voltage-regulator tubes, \( V_1 \) and \( V_2 \), are connected as shown, in order to stabilize the plate and screen voltages. \( R_9 \) is the usual dropping resistor for the VR tubes. Screen voltage is tapped off between \( V_1 \) and \( V_2 \). As a further-measure toward r.f. isolation, each side of the 115-volt a.c. line is by-passed, and one side of the 6.3-volt heater winding is grounded.

Isolation of the oscillator from the final load is important to stability, and this feature is provided, along with some boost of the oscillator output, by the 6J7 buffer stage. Choke-input coupling is used, as shown in Fig. 1. Some very good ideas for the mechanical design of this unit were gleaned from articles by Perrine and Brown in past issues of QST.

The 6V6G final-amplifier grid and plate circuits are gang-tuned. \( C_15 \) is an odd value of capacitance, 175 µfd., and is made up of three low-drift condensers with values of 25, 50 and 100 µfd., all in parallel.

The circuit diagram of the s.f.o. is shown in Fig. 1.

---

**Component Values:**

- \( C_1 \) — 200-µfd. variable (National SEH-200).
- \( C_2 \) — 500-µfd. fixed mica.
- \( C_3 \) — Centralab Type 924 or 933, low-capacity, negative temperature-coefficient pigtail-type condenser.
- \( C_4 \), \( C_6 \), \( C_7 \), \( C_8 \) — 0.01-µfd. mica.
- \( C_9 \), \( C_{10} \) — 250-µfd. mica.
- \( C_{11} \), \( C_{12} \) — 0.01-µfd. 600-volt paper.
- \( C_{13} \) — 100-µfd. mica.
- \( C_{14} \) — 175 µfd., composed of three mica condensers in parallel: 25 50 and 100 µfd. each, low-drift type.
- \( C_{15} \) — 25-µfd. variable (National Type US-25).
- \( C_{16} \) — 100-µfd. variable (National SEH-200).
- \( C_{17} \) — 500-µfd. mica.
- \( C_{18} \), \( C_{19} \), \( C_{20} \) — 0.005-µfd. mica.
- \( C_{21} \) — 25-µfd. variable (National SEU-25).
- \( C_{22} \) — 100-µfd. trimmer (National UM-100).
- \( C_{26} \), \( C_{27} \) — 0.02-µfd. 450-volt electrolytic.
- \( L_1 \) — 2 turns of spaghetti-insulated No. 20 bare wire wound directly under \( L_3 \) on the lower end of the form for \( L_3 \).
- \( L_5 \) — Filter choke, 10 to 20 henries, 100 ma.
- \( L_6 \) — Filter choke, 30 henries, 100 ma.
- \( RFC_1 \), \( RFC_2 \) — National R-100 r.f. chokes, 2.5 mh., 125 ma.
- \( S_1 \), \( S_2 \) — Panel-type d.p.s.t. switch (used as s.p.s.t.),
- \( V_1 \) — VR150-30 voltage-regulator tube.
- \( V_2 \) — VR105-30 voltage-regulator tube.
- \( J \) — Closed-circuit jack.
- \( P \) — Screw-type plug for shielded or coaxial cable.
- \( T_1 \) — Power transformer. Primary: 115 volts, 60 cycles. Filament windings: 6.5 and 5 volts. H.v. secondary: 350 volts each side of center tap, 100 ma.
The whole outfit is set in a National Type C-FB7 wrinkle-finished sheet-iron cabinet which is 12 inches wide, 12 inches long, and 8 inches high, and which includes a metal subpanel. Parts for each of the circuits are grouped around their respective tube sockets. The tubes themselves are mounted above the base, and the fixed condensers, resistors, r.f. chokes, etc., are arranged underneath. The top- and bottom-view photographs show these arrangements. It is apparent that the oscillator, in the aluminum box at the center of the cabinet, is isolated thoroughly from the 6J7 buffer stage at the left and the 6V6G final-amplifier stage at the right. The coils of the 6V6G input and output circuits are on opposite sides of the mounting base, and are placed with their axes at right angles to each other.

The power-supply components are lined up along the back side of the cabinet, and the transformer shields help to eliminate any possible hum modulation by stray inductive coupling between the 60-cycle and r.f. circuits. One thing that makes possible this arrangement is the approximately two inches of mounting space which is allowed in the main cabinet between the chassis and the cabinet bottom. This same feature is used in the oscillator box, except that the depth of the sub-base area is only approximately one inch.

From the top view of the rig, it is seen that the oscillator variable condenser, C1, is set in the middle of the box and coupled to the tuning dial by means of an extension shaft, flexible coupling unit, and the pulley with its additional shaft. Two holes of about one-inch diameter are cut directly underneath the condenser to allow two stand-off insulators to pass through the sub-base to the bottom of the box where they are fastened. The condenser is mounted on these insulators and in this way it is kept “above ground.” The coil form mounted vertically behind the condenser would seem to be excessively long for the mere 23 turns of No. 22 enameled wire in L1, but the additional length allows the winding to be placed over an inch above the metal base, with the same clearance from the top lid, and ample space also exists inside of the top end of the form for mounting the fixed condensers, C2 and C3. The translucent dowel which seems to be hanging between the coil form and tube is a piece of polystyrene rod which is threaded in each end to form a mounting brace for C4, C5, and R1, and also a separator for bus-bar wiring which helps to make the oscillator circuit mechanically rigid. Polystyrene feed-through bushings may be seen at the rear of the oscillator box, and they are used where needed inside the box to allow connections to go to parts underneath the base. This construction places the frequency-determining elements of the oscillator circuit in the upper part of the aluminum box, where some degree of stable temperature may be attained during any reasonably long period of operation.

The aluminum box for the oscillator is set up from grooved corner pieces and with plates cut from ½-inch stock (General Radio material). Dimensions are 5½ inches wide by 6½ inches long by 5½ inches deep. It could be designed to be plugged into banana jacks as a complete unit, in order to allow different frequency ranges to be covered. The box is set on rubber grommets at its four corners with one corner grounded to the main cabinet, as shown in the bottom view.

Several types of condenser-drive systems were tried out before the pulley-and-cable set-up was installed. A 1929-model Colonial broadcast receiver furnished the brass pulleys. The photograph shows approximately three turns of the cable around each of the pulleys. It is not hard to connect the pulleys if the condensers are set at either minimum or maximum to begin with and the cable is wrapped around each successive pulley, beginning with one on either end. The cable ends then are soldered down to the first pulley.

The National Type N dial permits readings down to one-tenth of one scale division. The dial covers 270 degrees, and the calibration of dial readings against frequency is approximately a straight line. This feature, in addition to the smoothness of operation, is a big help in resetting the rig to a given frequency, and some form of vernier scale is a necessity if calibration work is to be done with the v.f.o. Other condenser dials, such as those using gear-boxes, also should work provided they are designed for 270-degree rotation.

In the power-supply section, the bottom view shows one of the filter chokes mounted against the base. It is of the unsheathed variety, and so in this position, hum pick-up by the r.f. circuits above-base is prevented. The wire-wound resistor shown at the right of this choke is R9. Its location on the underside of the base indicates that, once the proper setting is decided upon, the tap need not be reset. Leads to the jack and switches on the front panel are laced together, and then laid down the middle of the base, well...
away from the tube sockets on either side. Any
hum pick-up thereby is prevented. The bus-bar
wire running at right angles to the laced wires
goes between the grid coil, L2, and the coupling
condenser, C18. In the top view, trimmer C15
is mounted between the two voltage-regulator tubes
shown just behind variable condenser, C17. The
rotor of this trimmer is grounded, and no r.f. coil
is near by, which means that adjustment of the
trimmer with a metal screwdriver will not affect
the circuit operation. On the other side of the
cabinet, both the rotor and stator plates of the
trimmer, C2s, are "hot" so far as d.c. voltage is
concerned. It is mounted between L2 and the 6V6G
tube. Adjustment of C2s affects the strength of the
output signal, although no effect on frequency
should be evident at this point.

No back-view photograph is shown, but this is
hardly necessary since only two cables are con-
ected at the rear. One of these is the 115-volt
a.c. line which is plugged into a female receptacle
shown in Fig. 1, while the other is a flexible
shielded coaxial line on a screw-type connector
which fits a corresponding plug adjacent to the
a.c. inlet. Those detachable cables make it con-
venient to carry the unit about without the
necessity of having cords and plugs dangling
around to be tripped on or to snag on something.

Operation

For tests of the v.f.o. signal, the first thing to
do is to turn on S1, located at the right of the tun-
ing dial, and then allow the tubes to heat for sev-
eral minutes. With uniform heat inside the cab-
net, S2 may be thrown on, to put the circuits
in full operation. A lavender-colored glow on
both of the voltage-regulator tubes indicates that
the power-supply circuit is functioning. This glow
may change in intensity when the condenser
plates are either nearly all in or out, because
of varying amounts of current drawn by the
circuits. A milliammeter of suitable range in-
serted into the circuit through the jack below the
tuning dial will indicate these changes. If a key is
substituted for the milliammeter through this
same jack, a check-up on stability of the signal
under keying conditions may be made.

At this point, trimmer condensers C16 and C2s
may be adjusted for best results. Their purpose
is to level off the tracking. An insulated screw-
driver is best to use here; and by all means, don't
get in bodily contact with this trimmer and the
chassis while the power is on!

A communications receiver or monitor with a
b.f.o. is necessary in order to hear the signal. Of
course if a stable oscillator such as one used as
a secondary frequency standard is to be had, it
may be substituted for the b.f.o., and then some
tests may be made on the frequency drift of the
outfit. However, this calls for more apparatus,
namely, a calibrated audio oscillator, so that the
amount of drift away from a given beat note,
which is taken as the starting point, may be
measured. Without the audio signal generator,
one may get an idea of what is happening by ob-
serving generally the change in tone of the beat

note which occurs when the stable oscillator out-
put and v.f.o. signals are mixed after, say, five-
minute intervals with the v.f.o. on and then off.

Measurements which are made with an r.f.
signal generator and an audio oscillator, both of
which were stable and calibrated, showed that
drift is almost nonexistent after a reasonable
warm-up period.

The construction is rugged, compact and light
enough in weight to be useful in alignment, cali-
ibration, test, and experimental jobs of various
kinds. It weighs only 25 pounds, which is not too
much to carry by hand in the lab, unless the more
convenient method is applied of mounting it in a
carriage on wheels. Either way, its normal, stable
operation is not affected.

Strays

Browder J. Thompson, associate research di-
rector of RCA Laboratories, was killed on a
Mediterranean flight in an Army plane on July 4,
1944. Serving as a consultant in the Office of the
Secretary of War, he was on a special mission "of
direct and vital importance to the war."

A former W7, Mr. Thompson was one of
America's foremost radio research engineers, mak-
ing notable contributions in connection with
screen-grid tubes, power pentodes and beam
tubes. One of the first to appreciate the effects
of electron transit time, he was responsible for the
development of the "acorn" tube and guided
important research on tubes for television and for
power generation at u.h.f. In 1936 he was awarded
the Morris Liebmann Memorial Prize by the IRE
for his contributions to the u.h.f. field.
One of the most inspiring true stories to come out of this or any other war is that of Warrant Officer George Ray Tweed, USN, KB6GJX. Tweed has already told many of the details of his activities in various popular magazine articles and in his forthcoming book, "Robinson Crusoe, USN," to be published this coming March by Whittlesey House. Here we present, for the first time, the hitherto untold radio side of his amazing adventure as a fugitive from the Japs.

Warrant Officer George Ray Tweed, USN, is known to millions of radio listeners, newspaper and magazine readers as the "Ghost of Guam" — but to us he will always be KB6GJX. Tweed's story is one of the most thrilling examples of the theory that the ham has what it takes, even if it means eluding the treacherous Japs for thirty-one months on the tiny Island of Guam.

Mr. Tweed had just finished his talk before a packed house at a recent Army-Navy Work Incentive rally in Hartford, when the writer came up and handed him his QSL card. Tweed's face lit up as he smiled and said, "You're a ham, too? Did you know I am KB6GJX?"

"Sure, we know that," and we explained that we wanted his story for QST.

Tweed did not hesitate. "Say — am I pleased to be talking to a ham again!"

And he really meant it. For W/O George Ray Tweed, USN, KB6GJX, is a regular dyed-in-the-wool ham. Enlisting in the regular Navy in 1922, Tweed served in various sections of Navy Communications. But, since 1932, Tweed always found time to build and operate his ham station. Before that he was also a radio man — but strictly Navy.

KB6GJX is a pleasant guy with whom to talk. He spins a good yarn and his ready wit and friendly manner made it easy to get this first-hand account of his radio activity during his hazardous life on Guam.

At first glance Tweed did not look like a man who had eluded and outwitted hundreds of Japanese killers for nearly three long and dangerous years. He did not look like a man who once had a price on his head — a price that multiplied in proportion to the amount of "face" he cost the Japs, until finally they declared him officially dead. Even then, however, the Japs did not cease their relentless search.

But as we talked there appeared behind Tweed's calm, easy manner the strength of character and determination that helped him survive — to become the only American to escape capture or death at the hands of the Japanese on Guam. By his courage and by his very presence on the island, Tweed became, to the native Chamorros, the symbol of the America they revered.

Tweed had made a promise to himself and to his native supporters, that he would not surrender or die — until the Americans came back to Guam. He kept that promise. That is George Ray Tweed, KB6GJX.

"Most of the story of my life has been pretty well covered in the newspapers and magazines," said Tweed, "so I'll begin with the time I started in ham radio. In 1931, while stationed in San Diego, I met a group of boys who were very much interested in radio. In fact, they were so enthusiastic about it I asked them why. Their reply was simple: 'We are hams — radio amateurs!' I'd been in the Navy for about nine years and in radio work all of that time, but never had given the ham game much thought. This chance meeting with these fellows convinced me that the ham game must be fun.

"Another Navy man, W6BMP, helped me get started," Tweed said. "It was a big day in 1932 when I got my license and went on the air as W6GJX in San Diego."

"What was your first rig?" we inquired.

"A pair of 210s in a TNT, and I was so sure I was going to like 40 meters that I soldered the coils in place. It worked pretty good. My first QSO was with W6ISI in Santa Barbara. I guess I went through the usual experiences as a ham, including 160-meter 'phone," Tweed continued.

"After working some time on this rig, and getting it on the air, I found that 160 lacked, for me, any DX possibilities, so I went back on 40 c.w. to stay, or at least that is what I thought."

Asked about his hamming on Guam, Tweed said ruefully, "That didn't last very long. In August, 1939, I arrived in Guam for a two-year tour of duty and, of course, I took my gear along. Early in 1940 I came on the air on 40 and 20 c.w. and had a fine time, working fellows in the other islands of the Pacific and in the States. Guam is 6000 miles west of San Francisco so now I was DX myself! It was hard to believe!"

"How about U.S. contacts?" we interrupted.

"I had frequent skeds with W6IOX, W5AAW, W5DWW, W5HIP, W6DH, KA1HQ and..."
W5DXR,” Tweed went on. “There were others, but those are the calls I remember well. 

“Before leaving California for Guam I had arranged with a parts store to ship things I would order when out on the Island. However, when I placed an order for equipment to get on 20-meter ‘phone, I waited and waited for the parts which never did come. Then in desperation I sent through W6IOX to Offenbach in San Francisco, and they shipped out the needed parts in a hurry. I picked out complete assemblies from the ARRL Handbook and told them to ship all the components needed to make that unit, giving them changes and exceptions I wanted.

“They shipped just the things I needed, and I went on 20-meter ‘phone early in 1941 and worked stations as far east as Minnesota. My ‘phone rig ended in a pair of 812s modulated by a pair of HY51Zs in Class-B. I used a 20-meter full-wave Zepp antenna.”

“Why and when did you close down KB6GJX?” we queried.

“On June 10, 1941, when censorship was started on the Island, the Navy officially closed down all amateur activity on Guam. We were ordered to suspend operation, pack and crate all our transmitting equipment. It was then taken to the Communication Office where it was sealed and stored for delivery to the rightful owner at some future time.”

“Do you think your stuff is still on Guam?” we asked Tweed.

“No, I guess I’ll have to go to Tokyo for my transmitter,” Tweed replied. “When the Japs took over the Island, they confiscated all that stored equipment.

“After June 10th I could not, of course, do any hamming, except to listen in. We were permitted to keep our receivers. It didn’t do me much good, however, for one of the first bombs to hit Guam on December 8th hit on my house right on my ham shack, and most of the gear left there was blown up.”

“Were there any other amateurs located on Guam at that time?”

“Yes, there were two other stations, besides KB6GJX,” Tweed explained. “One was Roy Henning, KB6CBN, of the Pacific Cable Company, and there was also a ham station owned and operated by U. S. Marines. A Marine named Anderson, a newcomer to Guam, did most of the operating at KB6OCL.”

“What happened to those other amateurs?”

“Henning was captured by the Japanese and presumably was taken to one of their prison camps somewhere. Anderson was at KB6OCL when a bomb, dropped in one of the first air-raids, made a direct hit on the station. Anderson suffered a fractured skull and died the next day.”

“Did you take any radio equipment with you when you took off for the hills to escape capture by the Japs?”

“No, I did not,” Tweed stated. “I had prepared some boxes of food and supplies for a tentative flight, but I delayed leaving until the last possible moment. Finally, I decided that if I was going I’d better leave — fast! I made it with about a minute or so to spare. It was night and the Japs were already in the vicinity. There was considerable shooting but not until we were actually on the move did the Japs start shooting at us. Then a machine gun started firing at the car as we drove away, but I had no lights on and they missed us and the tires, luckily.

“At that time I did not realize how useful a radio set would be,” he admitted, with a grin.

“George, the news stories reported that you were accompanied by another man on your escape to the hills. Was this other fellow a radio man?”

Tweed answered, “He was a radio man all right, but not a ham. He was Alfred J. Tyson, Navy radioman first class. We separated some time later on. Several months after that Tyson was killed by the Japs.”

“What kind of a place did you live in when you were in the hills?”

“I had various hideouts, but spent most of the time in a cave, formed by a huge overhanging rock and had fixed up a place under there. It was roomy and I had a shelf made out of rocks on which I built a work-table from crates.”

“When did you get the idea of using a radio set in the hills?”

“By the spring of 1942 I was anxious to know what was going on in the outside world. I knew that the Japs had been moving fast but there was no authentic news. Immediately after the invasion my friends, the native Chamorros, told me that the Japs had issued orders that all radio equipment must be turned over to them at once. Anyone caught with radio gear of any kind would be put to death.”

“The natives kept asking me what I wanted,” Tweed continued, “so I told them I wanted a radio receiver. They promised to get me one. The

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Chamorros more than kept their promise. They brought me a Super Skyrider 16 almost at once—took from the store of equipment confiscated by the Japs! For a power supply, they brought me a vibrator-pack and storage batteries. Those batteries came from wrecked cars on the island. I'd use up a battery, then the natives would take it to town and charge it on Jap juice and return it! At last the receivers came from wrecked cars on the island. I'd use up a battery, then the natives would take it to town and charge it on Jap juice and return it! At one time I had a stock of six storage batteries, so from this unexpected source I obtained one for another receiver identical to the one I already had. Only, the trouble was, it was inoperative because it had been stored carelessly and the dampness had got to it.

"I stripped parts from it to fix up the first receiver. By the time I had to abandon my radio receiver, most of its parts had been replaced. That dampness was terrifically hard on transformers and any type of fixed condenser. The receivers were not tropicalized and if I had not had the second one for parts, I would have been out of business long before I was."

What else did the natives bring you?"

"Well, they brought me some tools; a screwdriver, a pair of pliers — and a 110-volt electric soldering iron."

"What use could you make of the iron? Did you have your hideaway wired for power?"

Tweed laughed. "Sure I did! The natives brought me a gasoline engine driven 110-volt 60-cycle generator outfit. It had an output of about 100 watts a.c. as well as a d.c. output for charging storage batteries."

"What about gas?" we asked. "Or did you have a C book?"

"Oh, that's almost a yarn in itself!" Tweed remarked. "When the Japs took over there were lots of private cars on the island. These they confiscated and put to their own use. Since the Japs did not know how to drive, they wrapped most of the cars around trees. Then, instead of repairing them, the Japs would let the cars lie. The natives would swipe gas and batteries from these wrecks. I even got gas from wrecked Jap military vehicles."

"I used that gas engine a lot when I first had it, but later when the Jap patrols started closing in I could not run it because of the noise."

One day a native brought me a test meter, and was that a happy event for me, as I had begun to have trouble with the receiver! By-pass condensers had started to pop like firecrackers and I sure needed that meter. It was a small Triplett volt-ohmmeter, complete with a pair of test leads. Those Chamorros thought of everything but they couldn't find me a circuit diagram of that receiver."

"What about gas? Did you have the use of a regular junk box by then?"

"The natives brought me all the things they could find. Those fellows brought me wire and bulbs and I fixed up my own electric light system. But I could run only one thing at a time; it was a choice between the iron, the lights or the radio receiver."

"What kind of an antenna did you use, and what results did you have in picking up signals from the States?"

"I used an ordinary L-type antenna, insulated with transposition blocks, suspended between trees. It brought in KGEI, San Francisco, fine so I listened to that station most of the time. Whenever KGEI shifted to another channel or changed the times of transmission it threw me off until I found them again. I listened mostly for news as I was starved for news of the progress of the war."

"The first news story I picked up told me about the battle of the Philippines, and the last news I heard was a report that the Solomon Islands invasion had started."

"After I got the receiver going I began to give the natives bits of news to repay them for their help. In turn, they would bring me other things such as additional gasoline and food. Since word-of-mouth news is apt to be distorted I got the idea of writing out the news. I wrote the news in pencil and for some time. Then one of the natives, an ex-Navy employee, brought me an old battered Underwood. He managed to rustle some paper and carbon paper and then was reborn The Guam Eagle. I took this name as it was the name of a local paper published before the Jap invasion. The Eagle's circulation reached the record number of five copies! Later I swapped the old mill for another of the same kind, only this one was in better shape."

"What happened to your newspaper?"

"It was circulated among the Chamorros until the characters were no longer legible. Finally I stopped publication because the natives got to talking too much about the news. Even if they had not seen a copy of the Eagle themselves, they would brag about it to others. It got to be dangerous, so I quit printing it. I'm sorry that no copies of the Eagle are still in existence. When the natives hid my stuff, once when I was on the move, the dampness ruined all my papers and books."

"Did you have any kind of radio publications with you?" asked the writer.

"My native friends brought me a copy of the 1940 ARRL Handbook. They also brought me some copies of lesson books from CREI that I had been studying. There were several of these"
that the Japs had thrown away and the natives had recovered from the refuse heap at my home. Unfortunately, I found that the book of mathematics tables and formulae was missing."

"Well, why didn’t you send a native back after it?" the writer asked.

"I did!" replied Tweed with a grin. "I even made them a sketch showing the color and style of that missing math book - but they couldn’t find it. I guess the Japs must have needed it! Anyhow, it was gone."

"The news stories here in the U.S. stated that you tried to build a transmitter. Is that correct?"

"Yes, I did try," KB6GJX said thoughtfully. "I gathered parts to make a simple transmitter of about 30 watts output. I had the usual collection of junk from old sets and I worked on it for a time. Then one day a native, who had been a ham before the regulations prohibiting non-citizen activity, came to me. He offered to take the parts to town where there were more tools and it would be easier to assemble the equipment. I never saw this man or the equipment again."

"Perhaps he got cold feet?"

"Well— one way or another," Tweed acknowledged. "The Japs were killing anyone found with any kind of radio equipment. Anyway, I did not get my transmitter back and never got enough parts together to build another."

"What were you going to do with the transmitter when you got it working?"

Tweed continued. "I had two plans. For the first, I had worked out a code which, although it could not be readily decoded, could be solved by Navy cryptographers. I planned to put my transmitter on one of the frequencies used at Pearl Harbor, and send 'blind.' I figured our cryptographers could decipher the coded messages quicker than the Japs, and that would give the Navy the edge if they wanted to take any action on the information I could give them."

"If that plan failed I intended to get somewhere in the old 20-meter ham band and send 'blind' in the hope that some ham in the States would pick up my messages. These would be addressed in plain language with the text in cypher. However, since I never did get the rig on the air, neither plan was put into effect."

"You know, my radio training and knowledge raised the price on my head," Tweed stated. "Those Japs offered only 50 yen for my capture at first. Then after they found out that I was a radio man they must have figured I would try to communicate with the Navy and forward information. So they raised the price to 1000 yen. Almost as soon as I got the receiver going, they put on a more intensive search for me, for rumors were circulated that 'the American radioman had established contact with the States.' This was not true, of course, although I did receive numerous news broadcasts."

"How long did you continue your radio work?"

"About five months," Tweed explained. "In August of '42, I had to make a quick jump to a new hiding place and I gave all my gear to a native to hide for me. He did his job too well!"

Tweed said ruefully. "He practically buried it in another cave, and when we went to get it later the equipment was damaged beyond repair by water and dampness."

"That is about all there is to the story on Guam," Tweed concluded. "How about reversing our situation and let me ask you a question? What about ham radio since I went off the air in June of '41?"

"Well, George," we answered, "of course there have been many changes in equipment and technique, particularly in the u.h.f. region, mostly in military and naval communications but, unfortunately, the rest of us hams have been off the air almost as long as you have. So you haven't so much to catch up on in ham radio."

We had brought Tweed several back issues of QST and other ARRL publications and as he looked them over he remarked— "These sure look good to me. You know, I owe a lot of thanks to QST and the League. My ham background and experience was a big help to me when I went up for my examination for a rating as chief radio-man. I'm glad the ARRL has kept up QST. I know all their efforts on behalf of the hams will be of benefit to us in the postwar period."

"Are you planning a postwar rig?"

"You bet I am," replied Tweed. "The Navy held my pay for me while I was away, you know, and some of that money is going into another swell layout after the war."

"That's a promise! How about a sked?"

"Sure thing— right on the low end of 40 meters," Tweed smiled and answered.

Which just goes to prove— once a ham, always a ham. Not even 31 months of near-death dodging the Japs will change a fellow like George Ray Tweed, KB6GJX.
A Versatile Electronic Key

BY NORMAN SNYDER, * W3HBD

With the addition of a few parts, the simplified electronic key described by Wiley in QST for July, 1944, may be made into a unit which is portable and useful in several ways that are not possible in a more simple lay-out. One worthy addition is a built-in monitor-oscillator which may be operated by itself or along with transmitter keying. Then there are times when straight keying is desired instead of automatically-formed dots and dashes. The circuit described in this article shows how this may be done. Flexibility is incorporated in the circuit through independent controls over such factors as the tone and volume of the audio oscillator and lengths of dots and dashes. In addition, it is possible to substitute other types of tubes for those suggested in the circuit diagram of Fig. 1.

Compactness and portability of the improved keyer are illustrated in the photographs. Use is made of all available space inside the cabinet, and some parts are mounted, to advantage, on the outside panels. The entire unit may be held in one hand, since its base is no larger than that of a Vibroplex key, and its height is only six inches.

Some Modifications

Fundamentally, the electronic key here described is built around the simplified circuit described by Wiley. One modification is the insertion of a one-megohm resistor, $R_1$, in series with $R_2$ and $R_3$, for the purpose of lengthening the electronic dash, so that the action of the dash contact of a mechanical bug may be simulated. With $R_1$ in the circuit, there is a continuous contact for approximately the same length of time necessary to send six or seven dashes by hand. Therefore, with this resistor in the circuit, the key performs as an electronic bug. With $R_1$ shorted, it becomes completely an electronic key in which both dots and dashes are made automatically.

Another modification shown in Fig. 1 is the installation of a switch which combines $S_2$ and $S_4$—a three-position switch with left, right, and middle-neutral positions. Two independent s.p.d.t. toggle switches, shown in Fig. 1, will serve the same purpose, if you so desire, or if the type of switch mentioned above is not available. $S_2$ and $S_4$ working together will make a good combination.

One section of the switch, $S_2$, shorts $R_1$ when thrown to the proper side, and the other section, $S_4$, connects the “C” + to the cathode or “B” −, thereby canceling the opening and closing effect upon the relay by the RC network. Thus, an ordinary hand key can be utilized to close the “C” − connection to the grids of the 6N7 tube, whereupon the plate current is cut off, and the relay is released so that it makes contact with an external circuit and the keying monitor. The neutral position of the switch permits $R_1$ to perform its purpose in the circuit.

I am using four “penlite” cells in series for the “C” battery. Three volts seemed to make my particular unit perform rather well when the 6N7 was used, so I got this voltage from a second cell.
in series. I discovered that it was necessary to use the 4½-volt tap (third cell in series) for clean keying when using an external hand key. An important reason for using the six-volt tap is that by using this amount of voltage instead of three volts, either a 6J5 or 605 may be substituted for the 6N7 without any changes whatsoever in socket connections. Another advantage of using the 6J5 or the 605 instead of the 6N7 is that a line-cord resistor may be used in place of a filament transformer, because the filament drain in this case is only 0.3 ampere. This arrangement also will help to save cabinet space, not to mention wear and tear on the builder who may have some trouble in finding this particular type of filament transformer.

**Monitor and Relay**

The 117L7 tube serves a dual purpose. The diode section rectifies the line voltage, and the filter is composed of \( R_5 \), \( C_4 \) and \( C_5 \) in a \( \pi \) formation. The tetrode section, working as a triode, operates as a conventional Hartley oscillator.

The output transformer serves as the oscillation transformer. \( R_5 \) is used as a pitch control, and \( R_7 \) is a volume control. If the value of \( C_1 \) is changed, a different pitch will be produced. Therefore, the value of \( C_1 \) may be changed to provide the tone control, if \( R_5 \) is replaced by a fixed resistor with a value of approximately 25,000 ohms. If this method is used, the large value of \( C_1 \) makes it feasible to adjust the tone in steps by means of a tap-switch arrangement. The volume from the midget speaker is sufficient for comfortable copying in the average room.

The relay used is a sensitive type which operates at approximately 4 ma., and is essentially the same as the one used by Mr. Wiley, except that my relay has an extra set of contacts which key the monitor. Both sets of contacts, the external keying and the monitor-keying contacts, are closed when the relay is open. I suggest that the builder connect the two sets of keying contacts to the audio oscillator and then make the proper adjustments of relay-contact spacing so that keying of the external circuit, namely a transmitter, will "track" with the keying monitor before wiring the contacts permanently to the terminal board.

In this particular model, \( S_1 \) and \( S_4 \) were combined in a single d.p.s.t. toggle switch. However, it would be an advantage to have separate s.p.s.t. units since keying adjustments could then be made with the aid of the monitor, without keying the rig as well, when \( S_1 \) is closed and \( S_4 \) is open. \( S_1 \) controls the a.c. circuit while \( S_4 \) serves the purpose of opening the external keyed circuit so that if the keyer is turned off before the rig, the carrier will not be thrown on.

![Circuit diagram of the compact electronic key.](image-url)

**Fig. 1** — Circuit diagram of the compact electronic key.

- \( C_1 = 4 \, \mu F, 50 \) volts.
- \( C_2 = 0.01 \, \mu F, 50 \) volts.
- \( C_3 = 0.01 \, \mu F, 200 \) volts.
- \( C_4, C_5 = 20 \, \mu F, 150 \)-volt electrolytic.
- \( C_6 = 0.05 \, \mu F, 150 \) volts.
- \( R_1 = 1 \, \text{megohm}, \frac{1}{2} \) watt.
- \( R_2, R_4 = 100,000 \)-ohm potentiometer.
- \( R_3 = 10,000 \) ohms, \( \frac{1}{2} \) watt.
- \( R_5 = 50,000 \) to 100,000-ohm potentiometer. (May be replaced by 25,000-ohm fixed resistor under certain conditions; see text.)
- \( R_7 = 500 \)-ohm potentiometer.
- \( R_y = \text{Sensitive relay (4 or 5 ma. coil current).} \)
- \( R_p = \text{4 penlite cells (see text).} \)
- \( S_1, S_2, S_3, S_4 = \text{S.p.s.t. toggle switch (see text).} \)
- \( \text{SPKR} = \text{3-inch p.m. speaker.} \)
- \( T_1 = \text{Midget filament transformer, 115-volt primary, 6.3-volt secondary.} \)
- \( T_2 = \text{Midget push-pull output transformer.} \)
Constructional Details

Dimensions of the cabinet of this particular unit are $6\frac{1}{4} \times 4$ inches at the base, with a height of six inches. The front-view photograph reveals that there are five controls. The three at the top are, from left to right, for control of dashes, dots and speed. $S_1$ is between the monitor volume control on the left and tone control on the right.

On the left side of the cabinet is a four-con­nector terminal strip mounted for convenient tying-in of leads from the external hand key ($A$ and $B$) and transmitter key circuit ($C$ and $D$).

Protruding from the back panel, as seen in the rear-view photograph, are the tubes and the d.p.d.t. toggle switch $S_2-S_6$. This system of having the tubes outside has its advantages. There is no worry about ventilation in the cabinet, and therefore nothing gets overheated. The cabinet space saved also is a worthy asset, along with the fact that a pilot light is unnecessary, because one glance at the glass tube will tell whether or not the a.c. line circuit is turned on.

On the right-hand side of the cabinet is the speaker. A number of $1\frac{3}{4}$-inch holes are drilled into the cabinet panel to form a grille.

The key lever in this unit is the complete key mechanism from a Vibroplex Champion. (May its remains rest in peace!) I thought for quite some time before performing the agonizing task of disassembling the “bug” which had helped to give me so much enjoyment in handling traffic, in operating contests, and in general rag-chewing in the days of old. However, upon completion of the keyer, I realized that there was nothing to regret, because I still have the bug, but now it is of more modern design.

Attention! — Inventors

The following presents several inventive problems for which the Navy Department is seeking solutions and which they have turned over to the National Inventors Council for appropriate action. These problems offer an excellent opportunity for ham ingenuity.

1) Waterproof Jack:
Applications: Microphone, headphone and key jacks for telephone equipment.
Characteristics: Should prevent water or moisture vapor from penetrating equipment, even when immersed to a depth of ten feet; should be capable of being cleaned and dried without tools; should accommodate standard plugs.

2) Field-strength meter:
A small portable unit about the size and weight of a walkie-talkie for rapid checking of radio field intensities in the vicinity of radio transmitting stations. The instrument must be simple to use and accurate within plus or minus 10 per cent. Frequency range desired is 100 kc. to 20,000 kc. The range of field intensities desired is from 10 to 1000 millivolts per meter.

3) Radio antennas:
Antennas up to 300 feet in height that can be set up by unskilled ground crews. The efficiency of radio devices is often limited by the extreme difficulty of obtaining reasonable antenna heights quickly in the field. Very light alloys and special rigs for rapid erection by a ground crew without climbing are desired, in addition to ability to dismantle or collapse into packages not exceeding 20 feet in length. Insulated-base vertical antennas are preferable but grounded-base type could be used if the device had enough other advantages in the way of ease of erection and ruggedness.

4) Twin-triode vacuum tube:
A precision twin-triode vacuum tube with general characteristics of the current 6SN7 type having the following additional precision features:

a) After a fifteen minute warm-up, the $g_m$ of the two sides shall be equal over the normal operating range to within $+1$ per cent.

b) The tube shall be completely nonmicrophonic.

c) The above characteristics to be maintained over an ambient temperature range $+80^\circ$ C. to $-40^\circ$ C.

It must be possible to produce this tube, by mass production methods, with not more than 10 per cent rejects.

(Tubes presently available in production permit excessive variation in grid-plate conductance in the separate halves of the tube.)

5) Time-interval switch:
An expendable, compact, lightweight, rugged, mechanical device to permit successive closures of up to eight electrical circuits with a time interval between closures of about 0.2 to 0.3 seconds.

(Continued on page 98)
The Citizens Radiocommunication Service

Commission Proposes Walkie-Talkies for General Citizenry

Outsude of the amateur allocations, the most interesting feature to us in the Federal Communication Commission's report on its proposed postwar allocations above 25 Mc, was its announcement of its intention to create a new Citizens Radiocommunication Service for the use of the general public under minimum licensing requirements.

We comment on this topic on this month's editorial page and our purpose here is simply to present the Commission's own language from its report, which tells the tale very well indeed:

"The development of light-weight portable short-range radio communications equipment of the 'walkie-talkie' type has opened the door to a large variety of new private applications of radio. The success of such communications on the battlefront has been followed by many suggestions for peacetime use of low-power portable transceivers in the cities, on the highways, and in rural areas. To make possible the fullest practicable development of private radio communications within the limits set by other demands for assignments in the spectrum, the Commission on its own motion proposes to allocate the band from 460 to 470 Mc. to a new 'Citizens Radiocommunication Service.'

"The possible uses of this service are as broad as the imagination of the public and the ingenuity of equipment manufacturers can devise. The citizens radiocommunications band can be used, for example, to establish a physicians' calling service, through which a central physician's exchange in each city can reach doctors while they are on route in their cars or otherwise not available by telephone. Department stores, dairies, laundries and other business organizations can use this service in communicating to and from their delivery vehicles. Similarly, it can be used in communicating to and from the trucks, tractors, and other mobile units operating in and around large industrial plants and construction projects — many of which spread over a number of square miles. It can be used on farms and ranches for communications to and from men in the fields; on board harbor and river craft; in mountain and swamp areas, etc. Sportsmen and explorers can use it to maintain contact with camps and to decrease the hazards of hunting, fishing, boating, and mountain climbing. Citizens generally will benefit from the convenience of this service by utilizing two-way portable radio equipment for short-range private service between points where regular communication facilities are not available. During emergencies when wire facilities are disrupted as a result of hurricane, flood, earthquake, or other disaster, the service, as has been demonstrated by the amateur service, will be of inestimable value.

"Separate allocations are being made for urban and for rural transit radio communications, which will be available for communicating with city or interstate buses, trucks, taxicabs, etc. These services may develop on a common carrier or private basis on the frequencies set aside for those purposes. In either event, the citizens radio-communication band will be open to taxicabs, delivery vehicles, or other mobile units, as well as for incidental communication between fixed points.

"Common carrier operation in the Citizens Radiocommunication band will not be permitted, and no charge can be made for the transmission of messages or use of the licensed facilities. The service will thus be for the private use of the licensee who will be responsible for the use of the facilities under the regulations to be promulgated by the Commission.

"The 460-470 Mc. band which the Commission proposes to allocate for this service is essentially adapted to short-range communications, and as such, is admirably suited to the uses proposed. The rules will permit the use of 'booster' or automatic relay installations where necessary. It is anticipated that most transmitters on this band will be of low power and will not utilize extreme antenna heights. Higher power may be permitted in rural areas where no interference will result.

"The design of equipment for use in the citizens radiocommunication band should challenge the ingenuity of radio designers and engineers. A combination transmitter and receiver of reasonable weight can no doubt be mounted in a suitcase; a broadcast receiver, an alarm system, remote control systems, and other devices can perhaps be added to meet particular needs. By keeping the rules and regulations to a minimum, the Commission hopes to encourage ingenuity in design and in utilization.

"As in the case of the amateur service, the Commission proposes to assign no channels within the band. It is reasonable to suppose that most equipment will utilize a channel of 150 kc. more or less, making possible some 60 or 70 channels; but,

(Continued on page 100)
An F.M. Receiver for Carrier-Current Communication

Eight Tubes in a Narrow-Band Unit for Power-Line Work

BY GEORGE M. GUILL, JR.* W8VAN

In the December, 1941, issue, the author described a narrow-band f.m. transmitter suitable for use in carrier-current communication. In this article he gives the details of a companion f.m. receiver designed to operate in conjunction with that transmitter.

In any radio communication system the receiver is the most important link in the chain. The receiver to be described can easily be adapted to amateur carrier-current communication for operation in fixed, single-frequency nets.

The narrow-band f.m. carrier-current receiver, shown in Fig. 1, was built as a companion unit for the f.m. carrier-current transmitter which was described in a recent issue of QST. Conventional f.m. circuits are used with values suitable for low-frequency operation. With the values shown, results on the test frequency of 69 kc. have been very satisfactory. The tube line-up consists of two 6K7 r.f. stages, a 6J7 and a 6SJ7 limiter stage, 6H6 demodulator, 6SL7GT first audio and squelch, 6H6 squelch diode, and a 6F6 second-audio stage.

Transformers

Since r.f. transformers were not readily available for operation on 69 kc., r.f. chokes were used for coils and were tuned with mica compression-type condensers. The primary and secondary coils were coupled as closely as possible and, together with the tuning condensers and loading resistors, were assembled in shield cans two inches square and four inches high. Resistors R1, R2, and R3 were necessary to broaden the selectivity curve to prevent excessive sideband cutting and to insure limiter saturation on weak signals. The r.f. gain control is adjusted so normal line noises just saturate the limiter stages. In reasonably quiet locations it is usually run wide open and, under these circumstances, may be eliminated if desired. The neon bulb, N, protects T1 against high-voltage surges and excessive r.f. voltages when they are encountered. For amateur operation, between 160 and 200 kc., T1, T2 and T3 may be standard 175-kc. i.f. transformers, eliminating the need for the loading resistors.

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Limiter Stages

The two limiter stages are conventional and somewhat similar to the circuit of Fig. 732-B of the 1944 edition of The Radio Amateur's Handbook. Limiter grid-circuit time constants of about 4 and 6 micro-seconds, respectively, have been found satisfactory on all noise encountered so far. On the 44,000-volt power-line system, where all the tests were made, normal noise levels are more than sufficient to saturate the limiter stages.

The discriminator transformer, T4, was constructed in a can similar to the r.f. transformers, using r.f. chokes for coils. L4 and L5 are spaced equal distances on opposite sides of L7, and at such a distance that the resonant peaks of C5L5 and C6L6 are on 64 and 74 kc., respectively. Close separation of peaks result in maximum audio output voltage from the demodulator. With these peaks, the operating range, 66 to 72 kc. (for a 3-kc. deviation), is over the straight section of the discriminator characteristic curve. Of course, C7L7 is tuned to the center frequency of 69 kc. For amateur operation, T4 can be constructed from any suitable parts in the junk box or the discriminator circuit can be changed to one similar to Fig. 733-A of the Handbook, thus permitting the use of a standard 175-kc. i.f. transformer with a center-tapped secondary. In this case, coupling between primary and secondary coils should be adjusted for a straight discriminator curve over the operating range consistent with maximum audio output and both primary and secondary circuits are adjusted to resonance in the center of the i.f. pass band. For the theory and adjustment of limiter and discriminator operation see Chapter Seven of the Handbook.

Noise Squelch

The resistor-condenser filter, R21 and C21, attenuates frequencies above about 3000 cycles, the result of which is further to increase the desired signal-to-noise ratio.

When no carrier is being received the output of the receiver is noisy, unless some form of silencing squelch circuit is used. The 6SL7GT performs the function of first audio and squelch and, along with the 6H6 squelch diode, results in an effective silencing circuit. Without a signal, the plate current of the second section of the 6SL7GT is maximum, because the tube operates without bias since the drop across R22 is zero. When this maximum plate current flows, the negative voltage developed across R23 blocks the grid of the...
first section of the 6SL7GT, thus reducing the output of the stage to zero. When a carrier is received, the voltage developed across \( R_{12} \) will bias the second section of the 6SL7GT to cut off, thereby putting the first section of the tube into operation. Without the voltage across \( R_{2a} \), the first section operates as any normal amplifier stage with its grid-bias voltage obtained from the voltage drop across \( R_{24} \). \( R_{12} \) is adjusted so that the average noise voltage developed will not put the audio stage into operation. To prevent operation of the squelch by high-intensity noise peaks of short duration, which may be many times the average noise level, a time-delay circuit, consisting of \( R_{20} \) and \( C_{25} \), is introduced in the grid circuit of the squelch triode. Therefore, the bias on the squelch grid increases slowly under an impulse of noise, and as a result the noise pulse has passed on before the grid is blocked. The purpose of the 6H6 across \( R_{20} \) is to discharge \( C_{25} \) rapidly through \( R_{13} \) and \( R_{12} \). A somewhat similar squelch circuit is used in some a.m. commercial carrier sets. Switch \( S \) can be used to cut the squelch on or off, as desired.

The same care in lay-out and wiring should be used in the f.m. receiver as one would exercise when constructing any superheterodyne i.f. and audio stages.

The f.m. receiver is located in a power plant and under normal noise conditions the received f.m. signal has excellent speech quality and compares favorably with the power-plant’s p.a. system. There is just a small amount of noise, contributed by phase flutter, audible in the background when the audio gain is wide open. A reserve of audio output is available for the average-size room. Without carrier, the receiver is quiet. On one noise test, when noise was produced by an are to reduce the signal-to-noise ratio to about 1.7 (first-limiter grid-current ratio) the receiver, without carrier, remained perfectly quiet without any change in the squelch control, \( R_{12} \). Under these conditions the f.m. signal was understandable but the noise present was terrific.

The writer will be very much interested in hearing about the results obtained by anyone who has experience in using carrier-current f.m. on low-voltage distribution power lines.

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**Fig. 1 — Circuit diagram of the carrier-current f.m. receiver.**

- \( C_{1}, C_{2}, C_{3}, C_{4}, C_{5}, C_{6}, C_{7} \) — 160-500-µfd, mica padder.
- \( C_{8}, C_{9} \) — 225-650-µfd, mica padd er.
- \( C_{10}, \ldots, C_{16} \) — 500-µfd, mica.
- \( C_{10} \) — 100-µfd. mica.
- \( C_{20} \) — 250-µfd, mica.
- \( C_{21}, C_{22} \) — 0.001-µfd, mica.
- \( C_{23} \) — 500-µfd, mica.
- \( C_{24}, C_{25} \) — 0.002-µfd, paper.
- \( C_{26} \) — 0.05-µfd, Dypanol or mica.
- \( C_{27} \) — 0.05-µfd paper.
- \( C_{28}, C_{29} \) — 10-µfd. 50-volt electrolytic.
- \( C_{30} \) — 8-µfd. 450-volt electrolytic.
- \( C_{31} \) — 16-µfd. 450-volt electrolytic.
- \( R_{11}, R_{2}, R_{10}, R_{21}, R_{10} \) — 100,000 ohms, ½ watt.
- \( R_{2}, R_{3} \) — 50,000 ohms, ½ watt.
- \( R_{4}, R_{5} \) — 500 ohms, 1 watt.
- \( R_{6}, R_{7}, R_{11} \) — 2000 ohms, 1 watt.
- \( R_{8}, R_{9} \) — 100,000 ohms, 1 watt.
- \( R_{12} \) — 250,000-ohm potentiometer.
- \( R_{13}, R_{14} \) — 250,000 ohms, ½ watt.
- \( R_{15} \) — 50,000 ohms, 1 watt.
- \( R_{16} \) — 400 ohms, 1 watt.
- \( R_{17} \) — 25,000 ohms, 1 watt.
- \( R_{18} \) — 150,000 ohms, 1 watt.
- \( R_{19} \) — 50,000 ohms, ½ watt.
- \( R_{20} \) — 2000-ohm wire-wound potentiometer.
- \( R_{21} \) — 2000-ohm wire-wound potentiometer.
- \( R_{22} \) — 5 megohms, ½ watt.
- \( R_{23} \) — 20,000-ohm filter choke (Meissner Type 19-1955).
- \( L_{1}, L_{2}, L_{3}, L_{4}, L_{5}, L_{6}, L_{7} \) — 16-mh. r.f. choke (Meissner Type 19-1995).
- \( L_{8}, L_{9} \) — 10-mh. iron-core r.f. chokes (Miller 955).
- \( L_{10}, L_{11} \) — 8-h., 120-ma. filter choke, broadcast-receiver replacement type.
- \( T_{1} \) — See \( L_{4}, L_{5} \) for 69 kc.; standard 175-kc. i.f. transformer for 170-kc. operation.
- \( T_{2} \) — See \( L_{4}, L_{5} \) for 69 kc.; standard 175-kc. Lf. transformer for 170-kc. operation.
- \( T_{3} \) — See \( L_{4}, L_{5} \) for 69 kc.; standard 175-kc. i.f. transformer for 170-kc. operation.
- \( T_{4} \) — See \( L_{4}, L_{5} \) for 69 kc.; see text for 170-kc. operation.
- \( T_{5} \) — Power transformer, broadcast-replacement type for 10- to 12-tube receiver (Stancor F-6013).
- \( T_{6} \) — Output transformer, 6F6 to voice coil or line as required.
- \( N \) — ¼-watt neon bulb without base resistor.
- \( S \) — S.p.s.t. toggle.
Mine Sweeper!

BY LT.(jg) GEORGE ZIMMERMAN, USNR, * W2NNZ

This is a story about that part of the U.S. Navy affectionately known as the "splinter fleet" (so named because the ships composing it are made entirely of wood) and the men who man these ships in the mine-sweeper service.

In March of 1944 special secret orders came to a small number of YMS (motor mine sweeper) type ships to report for overseas duty. From the different sweep ports of the United States, these toilers of the sea assembled at an outfitting yard and were made ready to brave the challenge of the mighty Atlantic.

On the cold, misty morning of April 3rd at 0500, we said good-by to our homeland, and were on our way. We formed up as part of a huge convoy and settled down to the familiar watch routine. It took us twenty-two days to make the trip. Some of the newer seamen carved a spot for themselves on the lee rail, but for the most part it was a smooth crossing. We put in at Falmouth, England, and the next day the newspapers of that town carried a story of the "wooden wonders" which had challenged the ocean and won the fight.

We lay at anchor in that old English harbor and wondered what was to come next, for our orders were so secret that no one seemed to know why we were there. It wasn't long before several high-ranking Naval officers arrived and gave us the lowdown — we had been ordered from America to make the initial sweep of the scheduled U.S.A. beachhead for the invasion of France.

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Another Spitfire roared in to finish the job, his smoke screen completely enveloping us.

From that day on we practiced in formation, ironing out all the kinks in our sweep procedure — doing the same things over and over again until we could keep station with our eyes closed. Near the end of May we upped anchor and went to the port from which we were to leave on our trip to France. There, at Plymouth, we saw our first German air raid. Excitedly, we watched the brilliant searchlights pick out their targets and saw the sheets of "ack-ack" reach out to pluck the raiders from the sky.

We were put on a literary diet from the minute of our arrival as all the details and plans for D-day had to be studied. As we poured over the precise plans, we wondered and were amazed at the stupendous undertaking. Those beaches were miniature arsenals! We didn't like the looks of the photos of those ugly-looking guns which we would have to face, but there was cheerful comment to the effect that most of these death-dealing weapons would probably be bombed out by our air force. This proved to be largely true. Thank God for those brave men in the sky who did such a wonderful job that day!

June 3rd arrived — cloudy, and with a mean-looking barometer. We started out, passing through the sea-gate on schedule. The seas was in an angry mood and we were tossed around as if in punishment for invading her sanctity. Hour after hour went by. For the first leg of our journey we were at a semi-general quarters; i.e., with all stations manned, but only half the crew on watch. We were the first ships in the convoy, and as our journey progressed we could look aft and see a line of vessels that reached all the way to the visible horizon. In the air we could see Allied
planes giving us coverage, and their familiar white and black striped markings gave us quite a thrill.

On board our ship there was cool quiet. We knew what our job was to be, and we felt ready for it. We would be the first ships in, and so would make our run right under the muzzles of the giant shore batteries. This had a distinctly sobering influence on us, but we didn’t worry too much about it. This was the day which we had been so eagerly awaiting — the day we could start the Nazis on their final road to defeat. Or was this to be the day? The sea which had been beating us so mercilessly was getting worse. Even seasoned men were becoming seasick. What would happen to the landlubber infantrymen? We soon learned the answer, for just after we had pointed our bow on the last leg of the trip orders came to return to England. Nerves taut under the strain of an invasion sweep relaxed. Although it meant a reprieve from the rain of fire which we expected, everyone on board was disappointed.

Still at semi-general quarters, we sailed back to Plymouth. Then, just as we were about to enter the harbor, orders came to turn around and start back to France. Sleepy-eyed men crawled out of their warm sacks and once more we were on our way. Although the sea let up a bit, it still seemed too rough to attempt the invasion. But this time there was no turning back.

All day we steamed ahead, intent on the job we had to do, taking time out only to grab something to eat and to snatch a few minutes of sleep. As we started on the leg of the course which led to France, we came to general quarters. With all stations fully manned and everyone in readiness, we doubled our vigilant watchfulness. The night was as black as a burned-out filament, and station-keeping was difficult. Minutes ticked by.

Finally, down the line of mine sweepers came a weak red signal. This was it! Out went the gear in record time made possible only by those long weeks of practice. As we started on the channel — “buoying” as we swept — with eyes peeled for anything and everything. Again came that weak red signal: “Change course — change sweep formation — prepare to sweep parallel to the beach.” Even in the Stygian blackness we could see the outline of the French coast.

Sixty minutes before H-hour! Now it seemed as though all hell had broken loose. Intent as we were on our job, it was impossible not to see the terrific pasting the Germans were taking. Mighty reverberations shook the ship as the bombers hit the bull’s-eye of their targets on land. Flares of every color imaginable lit up the surrounding coast, and much to our dismay they lit us up also.

We were like sitting ducks on a pond, awaiting slaughter! Our ship presented a beautifully outlined silhouette only 1000 yards from the enemy gun emplacements, but we kept on sweeping and praying. Dawn was approaching fast and we could even see the shore guns now. Our task was almost over; just a little farther to go. We had been alone only a short while before, but now several cruisers had followed our swept channel and had dropped anchor awaiting II-hour. We finally completed our sweep, and still no enemy fire had reached us.

Then — wheecoughl barooomphl We weren’t out of it yet. That first shell had landed 50 yards on our beam, and the spray was a little too wet for comfort. Wheecoughl Barooomphl This time 50 yards on our other beam. We had been bracketed with the first two shots. All engines ahead standard! Let’s get the hell out of here! We weren’t supposed to play David and Goliath with the shore batteries. That’s what the big boys had followed us in for, and that is just what they were doing. Our two cruisers now traded shots with the 280-mm. guns that had started the fireworks.

Shells were still splashing around us when a Spitfire came zooming in, about 200 feet off the water, and started laying a smoke screen. That gallant ally paid with his life as an enemy shell scored a direct hit and the plane disintegrated in mid-air. Another Spitfire roared in to finish the job, his smoke screen completely enveloping us. We eased off, recovered our gear; and then, for the first time since we had started in, radio silence was broken. We heard our squadron leader report to the Flag that Operation One had been completed, 98 per cent successful! The tension was broken as cheers rang out into the brisk Normandy air, and soon all one could hear was, “What have you got to eat, Cookie?” Fifty-two hours with little or no sleep had proved to be too much; after setting a small watch, the rest of us dropped where we were. Although the din of guns was terrific we slept peacefully, thankful that we had been able to do a good job.

We exploded mine after mine that surely would have sunk one of our other ships.

March 1945
After a brief but much-needed rest we took a look around, and saw a sight never before seen by man. Barrage balloons spotted the sky for miles and at the bottom of each balloon was an Allied ship. Above the balloons was an endless stream of aircraft — and they were all ours. For days on end they came — dive-bombers, fighters, medium and heavy bombers, and, the most impressive sight of all, the C-47s with their precious cargoes of paratroopers. Right into the most blustering flak ever encountered they flew undaunted, and soon the blue of the sky disappeared as it was covered by a blanket of billowy white with the opening chutes. Thousands of these intrepid fighters dropped from the sky, only to be followed by thousands more. Then came the men in towed gliders. From the sky and from the sea came our fighting men, Americans every one, each doing the task expected of him. They secured that stretch of Normandy coast, overcoming obstacles about which the public still hasn't been told.

We stayed at our beachhead, and swept the sea continually. At night, enemy aircraft would fly overhead and drop mines and bombs. The first week was a hot one, a week of night alerts and of German planes overhead. Daylight would find us clearing the channels again and opening new anchorage areas for our supply ships. We were in popular demand, and were looked on with respect as we exploded mine after mine that would surely have sunk one of our other ships. We ran up quite a score of mines off Normandy, and made a lot of friends doing it.

As our boys on land made good progress in knocking the enemy out, we were following them up. Harbor after harbor was captured, and as they came into Allied possession, we cleared them of enemy mines. Sometimes we worked together with British mine sweepers, but most of the time we were on our own.

We weren't always as lucky as we had been on D-day, and some of our boys are no longer with us. They paid the full price for that mine no sweep-man ever wants to meet — that is, the mine which is swept not by the gear but by the ship.

But the rest of us are still here, sweeping and clearing enemy obstacles to our shipping. As long as the enemy is able to lay mines, we will be here to remove them.

When I started this story, I thought it might not be of interest to those hams who think of nothing but tubes and circuits, but after getting the story on paper, I've changed my mind. An amateur is a man who is ready and willing to serve his country. If he can do so with his radio experience, so much the better. But no matter what the job to which he is assigned, he does it to the best of his ability. The amateurs in this war are proving their worth in every branch and division of the services, and they have shown they have what it takes.

Strays

Keeping pace with the march of American armed might across the Pacific, the Office of War Information recently intensified its psychological warfare barrage against the Japanese by beaming "thought warfare," was strengthened on December 26th when a new 100,000-watt short-wave station was opened in Honolulu and a 50,000-watt medium-wave station was opened on the island of Saipan. The Honolulu station relays programs from the American mainland — in addition to broadcasting programs it originates — on to the Saipan station, which in turn beams them into Japan. The six new transmitters will help to increase the volume of this relay system.

Medium-wave broadcasting can be heard on ordinary civilian receivers, and FCC monitors have reported that Radio Tokyo is attempting various means to prevent and discourage listening.

U. S. War Bonds for Stories of War Service

QST wants reports on the experiences of radio hams in active service on the battlefronts — for immediate publication in this section, where feasible, or to be held confidential where security considerations so require.

Do you have a story of war service to tell — either your own or that of someone you know? Then write us a letter giving full details, including photographs, clippings and other substantiating data where available. If your story is published in QST, you will receive a $25 U. S. War Bond. Please indicate clearly on the report if it is available for publication in its entirety, if names, dates or places should be deleted, or if all information must be held confidential.

QST for
March, 1920, was the month when we decided we were as well known and important as The Saturday Evening Post and permitted our cover illustration to all but obliterate the letters QST — to the untold confusion of news dealers, who couldn't tell a customer whether they had a copy of QST or not. After all, it's our biggest issue since the war — 80 pages.

The League places great stress on local radio clubs to coordinate local relaying activity and particularly to control QRM. Thus the leading article in the issue is on “Radio Club Organization” and maintenance, by F. H. Schnell and R. H. G. Mathews. “Minimizing QRM” is the major problem of the day, under which title the editor discusses the acceptor-rejector circuit of the British Navy, known as the Red Plug. Amazing selectivity is claimed for this system, signals differing from the desired ones by but 1 per cent being reported eliminated, as is considerable static. Considering our desperate need for a QRM minimizer, this circuit offers possibilities. A. L. Groves, of Brooke, Va., with a prewar reputation for long-wave reception in the days of towering loading coils, renders the first of his many reports “On the Use of Honey-Comb Coils,” thereby giving those coils their first real impetus. Wm. F. Diehl, of A. H. Grebe & Co., describes the CR-3, “A New Regenerative Receiver for Relay Wave Lengths.” The Old Man is heard from on the subject of “Rotten House,” sitting up all night handling traffic. He sings that sad refrain, “Why Do I Do It?” Dr. Greenleaf W. Pickard, of Wireless Specialty Apparatus Co., is reported to be able to make a crystal detector oscillate by the application of 9 volts in series with it, controlled by a potentiometer. Traffic Manager J. O. Smith, in “A Little Journey,” entertainingly describes his visits to relay stations in twenty states.

A Board of Direction has just been elected for two years. For the most part the names are the same but there are a few new ones. Pursuant to a recent amendment to the Constitution providing that persons engaged in the manufacture or sale of apparatus are ineligible, we have lost the services of Clarence Tuska, of the C. D. Tuska Co., and R. H. G. Mathews, of the Chicago Radio Laboratory. Filling these places and two other vacancies are four new men: John M. Clayton, 5ZL, assistant manager of the East Gulf Division; Francis F. Hamilton, 9ZJ, district superintendent for the Indianapolis region; A. E. Bessey, of the coal-burner at 6BR, and M. B. West, prewar 8AEZ. We look forward to a meeting at which all the members of our Board can be present. QST is no longer available on subscription to nonmembers of the League. Effective next issue the newsstand price goes from 15 to 20 cents.

The nominal restriction of Canadian amateurs to a maximum wavelength of 50 meters has been lifted from December 30th until the opening of navigation on April 15th, during which time they may use 200 meters. The administration indicates that, if the results of this experiment are satisfactory, they are prepared to consider making the 200-meter wave a permanent assignment. A. H. Keith Russell has been named manager of the new Ontario Division, A. J. Lorimer for the St. Lawrence Division. The opening of traffic routes in Canada having been successful, the League announces now the formation of its Alaskan Division.

But there are plenty of relay troubles. Traffic Manager Smith reports that “the plain fact is that we cannot handle traffic with any certainty of promptness or regularity . . . There is only one way to successfully handle traffic and that is in short relays . . . There are many station owners, members of the League, good fellows, and of sound mind apparently, but who will not, for some reason, be content to be part of a successful system of relaying in short jumps — it must be 1000 miles or bust. And frequently they bust . . . The policy of monopolizing traffic on the part of a few stations is wrong and is hereby condemned . . . The unnecessary QRM caused by continual attempts at long-distance work is one of the greatest handicaps of amateur radio,” he asserts.

The Home-To-Lunch Club, H-T-L, is announced. All you have to do is send out a CQ for traffic between 12:30 and 1:30 any midday. “Is the Sixth District backward?” an editorial wants to know. Numerous good traffic handlers in the Ninth District are weeping bitter tears because they hear sixes but can get no response to their calls. We think we know the answer: we are advised that one- and two-stage amplifiers are just coming into adoption on the Pacific Slope. We call upon West Coast amateurs to fix up their amplifiers so that we can get through to them.

KO, on shipboard near Cuba, has worked 3BZ, 1275 miles, 1AW at 1000, 9ZN at 1775. 5AC has heard a 300-meter signal at 2800 miles. 3AI has heard a 200-meter wave a permanent assignment. A. H. Keith Russell has been named manager of the new Ontario Division, A. J. Lorimer for the St. Lawrence Division. The opening of traffic routes in Canada having been successful, the League announces now the formation of its Alaskan Division.

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Gear is in short supply because nobody could visualize the immense market when amateurs were reopened, only a few months back. VT-2s are available at $18 but only for laboratory use, not for transmission or reception . . . The Audiotron has now been licensed by DuForest but only for audio use . . . The Magnavox “Tele­ megafone” loudspeaker is now available, at $75.
It is a familiar story in the traditions of ARRL that HPM got the idea of a national organization of relayers when reflecting one morning upon his experiences the evening before in trying to get a message through to Springfield, Mass. The purpose of the message was to get in touch with an amateur up that way who was reputed to be making vacuum tubes; HPM wanted one. The name of that amateur was R. T. St. James, 1IZ.

On December 29th last, at Moody Field, Ga., Robert T. St. James, now W1LGI of Pittsfield and a real old-timer, received the War Department Emblem For Meritorious Civilian Service at a ceremony attended by the entire post. The presentation was made by Major Charles N. DeRose, W1CND, deputy commandant. The citation commended Bob as “co-inventor of the present composite panel-switchboard-type code and blinker combination classroom method of instruction” as well as for his “ingenuity in devising a temporary system of instruction pending arrival of regular Army equipment” and for “exemplary performance of assigned tasks.” The other co-inventor was similarly honored.

The photo below shows the OM and his Rube Goldberg — six tape machines putting code signals to 100 students’ positions at speeds from six to fourteen w.p.m. The Super-Pro provides on-the-air traffic to an advanced group.

Among the 513 prisoners snatched from a POW camp twenty-five miles behind the Japanese lines on Luzon, on January 30th, was Lt. William D. Gibson, SC, ex-W1DXZ. Gibson, technical engineer with the original Voice of Freedom station on Corregidor, went to the Philippines seven years ago to become associated with a radio firm. When the Japanese invaded the Islands he was commissioned in the Signal Corps. While imprisoned, W1DXZ with the help of another prisoner Lt. Frank Burgess, built a one-tube receiver of miscellaneous scrap. Typical of their improvisation was the use of tooth-paste tubes packed with acids for batteries. News picked up on the set was typed out and circulated about the camp. Gibson and Burgess were actually listening to the receiver at the moment the Rangers stormed the camp.

W9CAA advises that the Canadian nickel is not the only well-known medium of exchange bearing an inscription in code. According to W9CAA, the pay-checks issued by the American Telephone & Telegraph Co. are printed on paper which is covered by the words “Bell System,” spelled out, over and over, in Continental code.


W6NNF had just completed the installation of a low-frequency loading coil on a merchant ship when he was surprised to receive an invitation to a swell feed in the dining saloon. The sea-going sparks, delighted at having at last gained the use of his low-frequency rig, also pressed a tip onto W6NNF, reports W6NJQ who adds — “Take it from me, that tip is ‘one for the book.’ Usually we have to back off a ship fighting everyone from the captain on down!”

R. T. St. James, W1LGI-ex-1IZ, with the Rube Goldberg for which he and its co-inventor received the War Department Emblem for Meritorious Civilian Service.
Among the numerous Christmas greetings received at ARRL Hq. appeared one containing a new and original ham abbreviation, as well as an appropriate military scene. Sgt. Joseph H. Kadlec, W9UIN, sent us a hand-drawn greeting card showing a red-nosed GI standing guard on the Siegfried Line. In the background is shown a pillbox from which projects a long gun barrel. W9UIN wrote: "The gadget sticking out of the pill-box is not a U.h.f. antenna or anything related to radio. It is an 88 and, in this case, that is not to be interpreted as ‘love and kisses.’ . . . My wife and I have concocted a new ham abbreviation — ‘38,’ meaning ‘I love you’ — 3 little words and 8 little letters!” How do you like it, gang?

The many friends of XU3MA, Dr. William Malcolm, of Chefoo, China, will be happy to know that he is safely back in the U.S.A. after 52 years in China, 21 of them as port health officer at Chefoo, ending when the Japanese took over. Because of his advanced years the Japanese exempted him from internment and he was repatriated to Canada on the Gripsholm. He now resides at 956 Fifth Ave., New York.

Copies of the second edition of the useful and informative bulletin, “Difficulties Encountered with Electronic Equipment in Humid Climates,” may be obtained upon request by writing to D. P. Carleton, Humble Oil and Refining Co., Houston, Texas. The booklet deals not only with experiences with various types of equipment in humid climates but also with suggested remedies.

A new slide rule, by which it is possible to determine mechanically the position of the decimal point in involved expressions up to 19 places, is announced by Picket & Eckel, 53 W. Jackson Blvd., Chicago 4, Ill. In addition, 30-inch accuracy for cube roots and 20-inch accuracy for square roots is claimed for this 11-inch rule.

A simple device for the testing of wire insulation has been developed by S/Sgt Pasquale L. Wamil for the War Department. Test voltage is applied between the wire and a tubular electrode through which the wire is fed. If the insulation breaks down at any point as the wire passes through the electrode, a relay is actuated which rings a bell. Thus it is possible to determine instantly the point at which the insulation breaks down so that the defective section may be cut out of the reel.

A model “airport radio-service shop” was recently opened at the Grand Rapids (Michigan) Municipal Airport. The shop occupies the ground floor of a building about 20 X 50 feet. Two screened rooms have been set up. One is designed especially for the servicing of all types of automatic direction finders, and the other for the testing of aircraft receivers and transmitters. This field radio-service shop was set up by Lear, Inc.

March 1945
A FORWARD-READING “S” METER

HAMS who build their own receivers often desire to include a carrier-level or “S” meter in their sets. Unless one has a special meter whose normal needle position is at the right for zero current indication, however, the meter will read backwards. This means that maximum deflection with signal applied will be to the left. In order to have the meter read to the right at maximum signal it is necessary to invert the instrument. This often spoils the finished appearance of the set.

The circuit shown in Fig. 1 overcomes this difficulty. It consists of a v.t.v.m. with a modified Wheatstone bridge in the plate circuit. Values of components may, of course, have to be altered to adapt the circuit to conditions encountered in different receivers. With the values shown the circuit will function correctly with a 250-volt d.c. plate supply and an a.v.c. system developing up to 10 volts.

Fig. 1 — Bridge-type forward-reading “S” meter.

\[ \begin{align*}
R_1 & = 1 \text{ megohm, } \frac{1}{2} \text{ watt.} \\
R_2 & = 20,000 \text{ ohms, } \frac{1}{2} \text{ watt.} \\
R_3 & = 50,000 \text{ ohms, } \frac{1}{2} \text{ watt.} \\
R_4 & = 100,000-\text{ohm potentiometer.} \\
R_5 & = 0-1 \text{ d.c. milliammeter.}
\end{align*} \]

To adjust the range initially, ground the receiver a.v.c. circuit and set \( R_4 \) for zero meter reading; then remove the ground and tune in a strong signal. Note the point of maximum deflection, which should be at nearly full scale on the meter. If it is not, the value of \( R_3 \) and \( R_5 \) may be changed. Both resistors must be changed an equal amount to sustain balance in the bridge. Increase the resistance if the meter reads too high; decrease it if the reading is too low. A second method of adjustment is to insert a variable resistor between points X and Y. This may be a wire-wound resistor with a slider or a wire-wound potentiometer or rheostat. The first method eliminates the extra control, and thus is preferable.

A higher-range meter may be used, but the full-scale value should not exceed the maximum rated plate current drawn by the tube with zero grid-bias. — Kenneth M. Miller, W9NQT.

DON’T SHELVE THAT A.C.-D.C. SET!

HAVING spent many years at this hospital, I have been adopted into the family of nurses — and also into their families.

One of my inheritances, naturally, is the radio problems of the entire hospital. I don’t claim to be a serviceman but seldom a day goes by that one or more sets do not come to me for servicing, and that involves the ever-present problem — a.c.-d.c. tubes and the lack of them. It twists my heart to have to tell a nurse to try and find a 12SA7 or a 50L6 — which is only an easier way of saying: “Shelve it.” After one such set was shelved for months I figured out a plan for using 6-volt tubes requiring only a few easy changes.

This set had a burned-out 12SK7. I removed the leads from its set in the set and connected two ordinary electric-light sockets and bulbs as shown in Fig. 2. A shows the original connections to the set while B shows the modified circuit.

Some of the changes that can readily be made are: 12SK7 to 6SK7 or 6SJ7; 12SA7 to 6SA7; 12SQ7 or 12SR7 to 6SQ7 or 6SR7; 12K7 or 12J7 to 6K7 or 6J7; 25L6, 35L6 or 50L6 to 6F6, 6V6, 6U6, 6L6, etc.

It is inadvisable to use outside adapters in r.f. and i.f. stages because of the possibility of unbalance in the circuits which might cause birdies. However, an adapter can readily be used in the a.f. section. Do not forget that a higher-wattage bulb will be needed because of the higher current of the power tube. Start with a 40-watt bulb and gradually increase wattage until proper voltage is applied. — Harold Ramsey, W8TGU.

Fig. 2 — (A) A.c.-d.c. broadcast-band receiver before modification to permit use of a 6-volt tube to replace a defective 12SK7. (B) Circuit showing modification and addition of standard lamp bulbs as dropping resistors.
Of course, one of these symptoms is not a certain indication; but if two or three appear, try the following:

1) Heat tube without plate voltage.
2) Remove while warm. Do not displace tube caps any more than is necessary.
3) Apply a hot tinned iron immediately and carefully to both grid and plate caps. (Use a good grade of solder, if any is needed.)
4) Replace tube and clips when the caps have cooled.

The transmitter should function normally with no change in frequency if care has been taken in removing and replacing tube.

The apparent reason for the tube failure is the crystallization of solder connecting the grid-lead wire to the cap. This, so far as the oscillator is concerned, forms an open circuit, with a resulting open grid. The plate current jumps, and may exceed the tube rating if there is enough power available.

This procedure is not new, but I have not seen it described in QST before in connection with WERS gear. — Richard F. Atwood, WFBB-4/ WFBB-12.

A SHORT-WAVE LOOP ANTENNA

In an attempt to receive DX broadcasts originating in the U.S.A. and in London, I have been experimenting with antennas of various types in an effort to minimize interference from undesired stations operating on the same frequency. Since the local set-up makes it impossible to string up a terminated rhombic antenna, I now use the old familiar loop, tuned to the desired short-wave band and rotated until one of the nulls is placed on the interfering station. While the performance of the loop does not compare with that of a rhombic, it does a better job of reducing interference than any other type of antenna for which space is available.

The frame consists of a wooden cross, 19 inches across by 25 inches high, on which are wound three turns of insulated No. 14 wire. The ends of the antenna are tied to the stator plates of a 35-µfd. split-stator condenser. The condenser rotor and the center tap of the antenna are grounded to reduce hand capacity (and consequent change of tuning) to a minimum.

For coupling the antenna to the receiver I first tried a single turn, inductively coupled to the three-turn loop. When this turn was connected to the 600-ohm input of the receiver, the antenna tuning was affected by the tuning of the receiver. This was tried on the 9.5-11.75 Mc. short-wave broadcast band.

Next I removed the coupling loop and substituted a low-impedance match, tapping the antenna, 14 inches from the center tap on each side, and hooking the low-impedance leads to the receiver input. The loop was connected to about 4 feet of twisted line and mounted adjacent to the receiver.
The antenna tuning sharpened greatly and the signal strength came up to a level only one "S" point less than with a 75-foot outside antenna. The results with this arrangement were startling. Tuning to London each evening on the 11.75- and 15.0-Mc. bands, I was able to keep them tuned in fine, and placing the null on German interference cut it down two or three "S" points on the receiver's meter. — Lt. Henry B. Plant, SC, APO 512, c/o Postmaster, New York, N. Y.

UNIVERSAL OUTPUT TRANSFORMERS USED IN MODULATOR

About the most common, and yet one of the more inefficient methods of plate modulating an oscillator or power amplifier, is the Heising or choke-modulation system. Many WERS constructors seem to have overlooked the possibilities of transformer modulation utilizing replacement-type output transformers.

The usual circuit for transformer modulation of an oscillator or amplifier, when both r.f. and a.f. tubes are supplied from the same power source, is shown in Fig. 4. Here, $T_1$ is equivalent to an autotransformer of the proper ratio, with the plate voltage fed in at the tap and the modulator and amplifier plates taken off at opposite ends.

For low-power use, advantage can be taken of universal replacement push-pull output transformers, which will satisfactorily handle the low power involved in WERS sets and which are at the same time satisfactory in transceivers or transmitter-receivers, since a speaker winding is also supplied. Thus one transformer, by a judicious choice of values, can be made to take the place of two with greater output efficiency.

For example, consider a 12-watt oscillator, say a 6V6, modulated by a single Class-A 6V6, with a plate-supply voltage of 300 in a circuit as shown in Fig. 4. The plate current of the oscillator will be $I = W/E = 12/300 = 0.04$ ampere (40 ma.) and the equivalent resistance of the Class-C circuit will be $R = E/I = 300/0.04 = 7500$ ohms. The recommended load impedance of the 6V6 modulator for 300-volt operation is 8500 ohms. This mismatch is permissible. However, in tube combinations where a 2:1 or 3:1 mismatch occurs, a compromise must be made since the most generally available transformers have symmetrical primaries. It is preferable to put the higher load resistance across the modulator, which will give less distortion than the lower value, and accept slightly less audio-power transfer to the load, since this will help guard against over-modulation.

-Alan Sobel, 80-02 32nd Avenue, Jackson Heights, N. Y.

SIMPLIFIED METHOD FOR CALCULATING $L$ AND $C$ ON THE SLIDE RULE

After reading the hint "LC on Your Slide Rule" in November QST, I developed an alternative method requiring only one setting of the slide.

The formulas used are as follows:

$$f \text{ in cycles} = \frac{1}{2 \pi \sqrt{LC}} \text{ when } L \text{ is in henries, } C \text{ in farads.}$$

$$f \text{ in kc.} = \frac{159}{\sqrt{LC}} \text{ when } L \text{ is in } \mu \text{h., } C \text{ in } \mu \text{fd.}$$

Therefore, $f \sqrt{LC} = 159$; $LC = \left(\frac{159^2}{f}\right)$, when $f$ is in kc.

To find $LC$ for, say, 7300 kc. on the slide rule, first set 7300 on scale $C$ above 159 on scale $D$. Then read the $LC$ value on scale $A$—in this case 475.

If $L$ is given, $C$ may be found by setting its value on scale $B$ under the $LC$ value. The reading appearing on scale $A$ over the index $(1)$ on scale $B$ will be the value of $C$.

This method may be used for cycles, kilocycles or megacycles, farads, microfarads or micromicrofarads, henries or microhenries, when the correct placing of the decimal point is mentally calculated. — Murray MacKenzie, 520 Euclid Ave., Toronto, Ont.

ADAPTER FOR OCTAL-BASE RECTIFIER TUBES

Here's a handy idea in these days of hard-to-get rectifier tubes. Add a few jumpers to the socket, as shown in Fig. 5, and any 5-volt octal-base rectifier tube (such as 5T4, 5U4G, 5V4G, 5W4, 5X4G, 5Y3G, 5Y4G or 5Z4) will operate. — W. T. Watson, RT1/c, USCG Training Station, Groton, Conn.
CORRESPONDENCE FROM MEMBERS

The Publishers of *QST* assume no responsibility for statements made herein by correspondents.

SABOTAGE, SABOTEURS—AND THE HandBook

APO 493, c/o Postmaster, New York, N. Y.

Editor, *QST*:

... Our highest commendation for that most digestible manual, *The Radio Amateur's Handbook*. Well written, excellently illustrated, a model of technical instruction, it was deservedly regarded as an important component of our files—until a recent catastrophe. 

Two nights ago, when a suspiciously nibbled edge was observed...the matter was lightly dismissed. The *Handbook* was replaced in the files and the incident forgotten. This morning, unfortunately, our carelessness bore bitter fruit—for caught and killed in the middle of his breakfast was the culprit, a large India rat. He was eating—you have guessed it—our *Handbook*.

It is true there was some measure of satisfaction in the revenge afforded by the violence of the rodent's death; nevertheless, it is also true that prior to his end he had digested the book, thoroughly, up to page 79—Chapter Four, Section 3-9, on the oscilloscope! Need I say ours was a grievous loss?

It is our humble suggestion that a copy of the *Handbook* be forwarded to a competent biochemist, to discover, if possible, the palatable qualities of the paper which members of the rodent class find so stimulating. Experimentation in this field may eventually lead to a more substantial overseas' product—making disasters such as ours bad dreams of the past.

—M/Sgt. Julius J. Owsik, W2DYO

105 E. Washington St., O'Fallon, Ill.

Editor, *QST*:

I was sitting peacefully in a movie theater, watching a newsreel of the captured German saboteurs who recently landed off the coast of Maine, when on the screen flashed pictures of their radio equipment. I almost jumped out of my seat, because next to the German's transmitter lay a copy of the ARRL *Handbook*.

I have always realized how much the Handbook has meant to my brother, W9ZIF, and myself, but now that the enemy knows how essential it is...I suppose it is no longer a military secret that we call it the "ham's bible."

—Thomas T. Gordon, LSPH

165 Church St., Milton 86, Mass.

Editor, *QST*:

...You’ve been asking the boys to report on their experiences on the battlefronts. I was serving aboard the SS George E. Pickett as chief radio operator when the allies invaded Normandy. Our ship was one of the first large cargo vessels to appear off the invasion beachhead on D plus one.

It was our job to man the v.h.f. equipment in the shack and also take care of operating the walkie-talkie on the flying bridge during enemy air attacks, passing on fire-control instructions to the gunnery officer. It was tough enough being cooped up in the shack while the firing was taking place, but being up on the flying bridge taking care of the walkie-talkie and dodging all sorts of lead and steel being fired at you was quite another thing. To say the least, it really felt good to take off our boots for a change when we returned to England a week after D-day.

I might add that during the next six months, while I was aboard ship getting supplies over from England to France, I ran into quite a number of operators from the other ships that took part in the invasion. ...I’m mighty glad to pass the information on to you that a good percentage of those operators are or were at one time or another hams...Wherever there’s a good scrap going on, you’re sure to find the amateurs right in the middle of it.

—Ensign Max Plung, USMS, W2HNR

March 1945
BOOKS IN COMBAT

109 Powell Ave., Ottawa, Canada
Editor, QST:
I have just returned from Europe after four years in the combat areas, where I found the various ARRL publications of great value for reference and instruction. Grammer's little book, A Course in Radio Fundamentals, worked wonders in bringing my technicians to a higher standard of knowledge.

In fact, these books were so valuable that I did not have the heart to bring them back with me and thereby rob twenty men for the benefit of one flight lieutenant.

— F/Lt. W. M. Marshall

NO BETTER READING

c/o Postmaster, New York, N. Y.
Editor, QST:

... Thank you for your prompt action on my request for the back issues of QST. Here in the hospital there is little besides reading to do, and for a ham there is no better reading than QST. I haven't as yet met any of the local amateurs, but I get to town now and then and I'm going to see if I can locate some of the gang.

I was very much interested in some of the items mentioning postwar allocation of frequencies for the amateur radio bands. It's nice to know we have someone at home to insure a fine future for the best hobby in the world. You will have a new member one of these days; the XYL is bone up so she will have her ticket by the time I get home. ...

— Sam W. Ekmo, W7IGO/W8UOA

PRE-W1/KA

Somewhere in the Philippines
Editor, QST:

... I'm out here as engineer on a Press Wireless unit similar to the one in Europe about which you doubt you have heard. I have been in the Pacific theater for some months. We came out as far as New Guinea by air and thence in a convoy, arriving on the beach in the Philippine Islands in the early part of November. We set up operations and established the first commercial communication circuit from the Philippines to the U.S. since the Japs took over on December 31, 1941. Contact was made on November 14th, after we'd been on the air but twenty minutes.

Our transmitter is a 400-watt job feeding a rhombic antenna. We have worked as high as 425 words per minute, and during a portion of every day we've had a high-speed tape signal direct to Los Angeles. Our business is all press - about everything you've read in the papers from here the past few months has been handled on our circuit.

The set-up here would do far more justice to a typical ham installation than to a point-to-point commercial job, but it's a case of making out with what you have to work with. There isn't any radio store a few blocks away.

From the standpoint of "pioneering," I think the job we did was typical of the ham spirit. And from an engineering point of view a description of the set-up might be of interest. We set up the station and made our first contact without so much as a pair of pliers. We had a screwdriver which I had brought with me and a few mechanism's tools which came with our gas-engine generator set. We had troubles aplenty with the high humidity, rain, evening air activity and other things which will have to await the telling. We were even delayed more than twenty-four hours by a bombing which destroyed our transmitting antenna.

... During the first few weeks on the air we had a single light bulb to illuminate our rather dark operations point. We were located in a corner of a big concrete building with few windows. Repairs on equipment were often made by flashlight or lantern light.

The receiving installation uses Hammarlund Super-Pros, modified slightly to meet our special requirements. The receiving antenna arrangement has varied; most of the time, however, we've used a Vee. At times this has been put out of commission, and then we've fallen back on the familiar doublet.

As if we didn't have enough grief, a swarm of ants got into our keying oscillator unit, choosing a shielded variable condenser as an assembly place. The unit had to be torn completely down, sprayed with bug killer, cleaned and re-assembled. At times this has been put out of commission, and then we've fallen back on the familiar doublet.

But, to date, we haven't been off the air except for routine maintenance since our initial contact of November 14th.

The unit is under the direction of H. E. Stovall. Ed was formerly manager of Mackay Radio in Manila and since the Fall of 1941 has been with Press Wireless at Los Angeles. Our chief engineer is George Luckey.

My job is associated with the receiving and terminal equipment (keying apparatus, perforators, etc.). I also handle any voice transmissions made via our facilities. It seems odd to be talking with the engineers in Los Angeles and yet realize how darned far away home actually is.

All in all it has been a real adventure, and we all feel that a good job has been done thus far. But there's still much to be done and it may be a long time before I get back to the States.

— T/O Forrest A. Bartlett, W6OWP

WANTED: A STORY ON WSL

c/o Fleet Post Office, New York, N. Y.
Editor, QST:

I think that an article giving information about and the history of WSL, the loudest station heard in the past few months has been handled on our circuit.

The set-up here would do far more justice to a typical ham installation than to a point-to-point commercial job, but it's a case of making out with what you have to work with. There isn't any radio store a few blocks away.

From the standpoint of "pioneering," I think the job we did was typical of the ham spirit. And from an engineering point of view a description of the set-up might be of interest. We set up the station and made our first contact without so much as a pair of pliers. We had a screwdriver which I had brought with me and a few mechanism's tools which came with our gas-engine generator set. We had troubles aplenty with the high humidity, rain, evening air activity and other things which will have to await the telling. We were even delayed more than twenty-four hours by a bombing which destroyed our transmitting antenna.

... During the first few weeks on the air we had a single light bulb to illuminate our rather dark operations point. We were located in a corner of a big concrete building with few windows. Repairs on equipment were often made by flashlight or lantern light.

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— T/O Forrest A. Bartlett, W6OWP
ECHOS OF AN HISTORIC QSO
Loudon, N. II.
Editor, QST:
Among the many interesting things appearing in the magazine every month, one of the most intriguing is the section recalling “25 Years Ago This Month.”

In the January issue, on page 41, there is a line that is of particular interest to me — “... and a New York ham is reported to have worked Ohio on voice on 10 watts.” I wish to say that the report was correct, although no one knows how much grief was necessary before it took place. I happen to be the fellow that actually did it, but the transmitter was assembled by a Navy CPO named Daniels. (Shortly afterward he worked on the gear which first made possible the complete operation of a battleship by remote control.) The transmitter used W.E. “E” tubes. Our station call was 2ARA. The call of the Ohio station I cannot remember; unless I am mistaken, however, the town was Oberlin.

At present I am not very actively connected with radio. Instead of working on the stuff described in QST I now help to print it. My job is that of pressroom foreman at the Rumford Press in Concord. The only radio work is with the Fire Department set-up here in the state, operating on 39,420 kc., a.m., under the call WLOM.

Thanks for recalling “the good old days.”
— J. Westly Robinson

HOW AN AIR-WAC LEARNED THE CODE
73 Middle St., Wiscasset, Maine
Editor, QST:
One evening not so long ago, as I sat toying with the dust-covered key and dreaming of the good old days, a YL friend of mine burst into the shack. Said she, breathlessly: “I joined the Air-WAC today and they told me that there was a good chance that I could get into radio communication if I knew the code, and I have a three-week furlough before reporting for active duty, so how about teaching me the code?”

I gazed at her dubiously for a moment and then, glancing at my trusty key, felt the challenge to a true ham. “Okay, toots,” I said, with my fingers well crossed. “Here’s a copy of the ARRL Handbook. Take it home and study the code table, and report tomorrow night for practice.”

Much to my surprise, she appeared promptly the next evening. We set to work with a buzzer loaned by my good neighbor, W1GXY. She had learned all the characters, including the numbers, from the book, and had them down pat by the dit-dah method.

Three weeks later to the day her code speed was fourteen words per minute, solid, on either straight or code group copy as per the standard FCC five minute test... If that is not a record then my seventeen years of hamming have failed me.

She left for her basic training in the WAC, happy in the thought that she would be a radio operator. However, she is now doing clerical work at Fort Oglethorpe. Ah me, the Army...
— Bernard Seamon, W1AFT

KILOHMS?
3001 Cypress Ave., Cleveland 9, Ohio
Editor, QST:
For some time I have been using several abbreviations relative to resistor and condenser values, and find them much more easily handled than a series of zeros. I believe they warrant adoption by the field.

For instance, a resistor of 5000 ohms can be read 5 ko., meaning, “five kilohms”; one of 15,000 ohms, 15 ko., etc.; and a resistor of 600,000 could be designated 6 cko., meaning “six hundred thousand ohms.”

I like the abbreviation “kilo” in lieu of “000,” and believe it rightfully deserves to be used.
— George R. E. Kepler, W807

QST ARTICLES
375 E. 205th St., New York 67, N. Y.
Editor, QST:
... The choice of articles in QST is swell. Are articles about microwave technique out for the duration? Yes or no, keep up the good work... .
— Alexander Jaffe

A RADIOMAN’S NIGHTMARE
Gary, Indiana
Editor, QST:
The following poem was written by S. W. Scott of Los Angeles. It is intended to be sung to the tune of “Mairzy Doats”— if you haven’t forgotten that one by now:

A.C. volts
And D.C. volts
And little ohms and amperes.
A little inductance, too,
Wouldn’t Q.
With micromhos
And e.c.o.’s
And little microfarads,
I’m more than a little nuts.
Aren’t you?
If these terms sound queer
And screwy to your ear,
A bit off resonance and freaky,
Say LCR and a.v.c.,
I think my condenser is leaky.
Ohmzy’s Laws
And Kirchoff’s bores—
This is a little crazy.
Radio’s crazy, too.
Aren’t µ?
— Anton Varga, jr. RM1c, W8WIB

March 1945
Ham Help for Ex-Service Men. In Op News in the January issue of QST, we suggested that amateurs and clubs give some thought to helping blinded vets toward an understanding and appreciation of amateur radio in the hope that the social contacts over the air would be a genuine contribution to rehabilitation. Certainly we can think of no more splendid project on the part of any individual or group. Some of you have been privileged to meet personally sightless amateurs in prewar days and know the great boon that ham radio has been to our less fortunate brethren, who might otherwise live a lonely existence apart from the physically normal world. The time is at hand when war casualties are returning from the battlefronts in growing numbers and our aid to the blinded and disabled servicemen must start now, if at all.

We are in receipt of a letter from an Atlanta amateur, who has put this idea into practice so beautifully we are quoting his letter in full. His work goes beyond the confines of amateur radio and embraces ideas which can be put into execution, with minor variations to suit local needs, by all hams or clubs in a position to undertake such a program. It merits your careful study.

Communications Dept., ARRL:

“You might be interested in knowing that for the past two months I have been conducting radio classes at Lawson General Hospital near Atlanta. These classes are under the sponsorship of the Red Cross and were started after a conference with Captain A. Reiger who heads the occupational therapy department at Lawson.

“I spend each Monday night in the occupational therapy shop conducting classes in radio construction and repair. All the receivers are in kit form so the patients can continue the work without an instructor during the rest of the week. I am also giving theory during the shop period. A teleplex code practice set is available at any time. So, fellows, there you have it. W4BCR has done the spadework and has gotten results; he is willing to pass on his experience to others who have the time and inclination to help where help is needed.

“The cost of the kit parts is divided between the Red Cross and the local Elks lodge.

“I treat all the men as though they were normal, although some find it necessary to create their own ways of doing things. The best method is to expect from them the same results as if they were entirely normal. In our high school classes we are taking care of the 400-odd radio receivers at the hospital but we are gradually bringing them into the O.T. shop so that the amputees can receive actual repair experience.

“The most gratifying part of the job is to see the men gradually change their views of life when they find that, in spite of their amputations, they can still do everything a normal man can. Some of the fellows who have had their right arms amputated really do a masterful job of left-hand soldering.

“How all the men as though they were normal, although some find it necessary to create their own ways of doing things. The best method is to expect from them the same results as if they were entirely normal. In our high school classes we are taking care of the 400-odd radio receivers at the hospital but we are gradually bringing them into the O.T. shop so that the amputees can receive actual repair experience.

“I am sure anyone who starts classes such as we have at Lawson will have the satisfaction of knowing he is really contributing to the morale of these wounded men. To see a man with very little desire to live take an interest in radio and then begin to talk about going to radio school when he is discharged, is well worth the effort spent in organizing the work.

“I would be glad to advise anyone who wishes to start a class in a government hospital or rehabilitation center, if he will drop me a line.”

— C. H. Krueger, W4YC-W4BCR,
Radio Instructor
Technological High School
Atlanta, Georgia

So, fellows, there you have it. W4BCR has done the spadework and has gotten results; he is willing to pass on his experience to others who have the time and inclination to help where help is needed. We can think of no other project which will bring more lasting happiness to a disabled veteran coupled with more personal satisfaction to the amateur. Let the CD know what you do.

Amateurs Operating. To those of you who think ham radio is completely shut down around this war-ridden earth, it will be welcome news that a few, a very few, amateurs are still operating in a very few places.

Information reaches us from OAA4D in Miraflores, Peru, via Robert Hoiermann, Alliance, Ohio, that he, OA4E, and one other Peruvian
amateur have permission to operate, but OA4D
is the only one who really works at it to any ex-
tent. He has a sked every Saturday at 4 P.M.
Peruvian time (2100 GMT) with CX3CN in
Montevideo, the only Uruguayan ham permitted
to operate in his country. The latter is a bed-
ridden cripple and, as radio is his only diversion,
his government granted him this privilege. These
stations operate on the low end of 20 meters.

Hams in Paraguay are permitted to operate,
but we have no information on frequency or type
of transmission. However, as many South Ameri-
can countries allowed prewar civilian phone opera-
tion without technical proficiency or code re-
quirements as we know them and no amateur in the
States has reported hearing c.w. ham sigs from the south, we infer it is not the sort of opera-
tion to intrigue the ham.

The Chinese amateurs have been consistently
active in spite of years of war in their land, and
the China Amateur Radio League manages to
hold a convention annually. President Bailey and
Secretary Warner of the ARRL have sent con-
gratulatory messages via short wave broadcast to
the China Amateur Radio League manages to
attend. No Chinese amateurs have been heard
in all countries allowed prewar civilian phone oper-
ation to intrigue the ham.

Ohio CAP Field Day

This communications section of the Ohio Wing,
Civil Air Patrol, assembled November 12, 1944, with radio
equipment for a day of activity at Ohio State University’s
Don Scott Airport, the official airport of the Ohio CAP
Wing.

Inasmuch as it was the first display of CAP 112-Mc.
equipment in Ohio, the general public, and especially mem-
bers of WERS units in central Ohio, attended the meet.

Also present were high CAP officials, including Major
Frank A. Adams, USAAF, National Communications
Officer of the CAP; Lt. Col. George A. Stevens, CAP; Ohio
Wing Commander, and Major Kent H. Smith, CAP; Wing
Operations Officer.

Army officers included Capt. T. S. Stein, Signal Supply
Officer of Fort Hayes, and Lt. J. L. Deets, Communications
Officer of the near-by Lockbourne Army Air Base. These
officers acted as judges aided by Professor Robert C. Higg
of Ohio State University.

Army radio equipment was offered as prizes in addition to
the equipment donated by local jobbers. Awards were made
to the squadrons represented by the winning contestants.
Army prize awards included three complete compass units
with motor-driven loop antennas, receivers, dynamotor
power supplies and azimuth and compass meters. A com-
plete ferry-command set, including a two-band crystal­
controlled transmitter, two receivers and power supplies,
all neatly installed in a large leather carrying case made up
installed in the Flying Fortress.

Eighty-one enlisted CAP members registered for the meet
and about twenty-five airplanes had been flown in earlier to
participate.

The first event was the code speed contest conducted by
Army operators from the Lockbourne Army Air Base, under
the direction of Lt. Deets.

First place was won by Lt. Paul R. Wagner of Toledo.
Wagner, using Army code procedure, received two minutes
of straight copy at a speed of eighteen words per minute
without an error. Second prize was won by Sgt. Frank
Hackman of the Lima squadron. Lt. Paul Crowell of Spring-ield placed third. All copying was done by hand.

Lt. Wagner, who incidentally stole the show by winning
first place in two other events, was issued a radio compass
unit for the Toledo squadron for his efforts in winning the
code speed event.

In the afternoon engineers from the University's station,
WOSU, arrived with portable equipment to broadcast the
events.

Then began a general inspection of the equipment on dis-
play in the hangar. The gear was judged for engineering,
neatness and performance. Specifically, the judges were
called upon to select the best transmitter, receiver, trans­
ciever, smallest transceiver and best portable v.h.f. antenna.

The transmitter award was made to the Cleveland squad­
ron; receiver, Canton squadron; transceiver, Toledo squad­
ron; portable v.h.f. antennas, Toledo squadron. The smallest
transceiver prize went to “Tiny Tim,” a unit so small that

MAR
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1945
61
Hidden Transmitter Hunts for WERS

Although no illegal 112-Mc. transmitter operation has ever been reported in the Cincinnati area, members of the Queen City Emergency Net feel that they are now in a position to run down any such transmitter efficiently. They have about fifteen mobile units equipped with various types of 112-Mc. directional antennas, as well as several battery receivers so equipped. As for experience, they have five "illegal transmitter hunts" under their belts, with more to come.

In May of 1944 it was decided that the development of direction-finding equipment for WERS use might prove helpful, not only in running down illegal transmitters, but also in discouraging their appearance. The matter was discussed by QCEN officials and the area radio aide for WKHO stations, J. H. Thornell, who gave his approval. The first hunt was scheduled for July, 1944, and the QCEN members started construction on directional equipment.

The transmitter was hidden at a point in a fifty-square-mile area in the suburbs of Cincinnati. The boundaries of this area were published in The Listening Post, official organ of the QCEN, and repeated in the context. United Radio of Cincinnati, volunteered to donate about $15.00 worth of prizes for the first three "finders."

An Abbott TR-4 was used as the hidden transmitter and was continuously modulated by a c.w. oscillator except for voice announcements every five minutes.

Four of the ten contestants found the hidden transmitter within the allotted two-hour WERS test period.

Four more similar hunts were held during successive months. Each time the transmitter was hidden by a different group in a different part of Hamilton County and Northern Kentucky. As the "hunters" became more experienced, the "hiders" became more tricky. The transmitters were hidden in the open, close to the car, or out of the announced area, to cause numerous reflections. In the November hunt a three-element directional beam was used on the hidden transmitter, and the signal bounced up a valley. Also, the announced area in which the transmitter was hidden was increased to seventy-four square miles.

In spite of this, the transmitter hidden in the November event was found first in twenty-three minutes, and second in fifty-six minutes.

Now a word about the various antennas used. For purposes of comparison, a point system of scoring has been adopted. Each first place score was awarded ten points, each second place five points, each third place three points, and each fourth place two points. In the five hunts that were held, the points per type of antenna stack up as follows:

<table>
<thead>
<tr>
<th>Type of Antenna</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three-element vertical</td>
<td>22</td>
</tr>
<tr>
<td>Three-element horizontal beam</td>
<td>14</td>
</tr>
<tr>
<td>Single-element horizontal</td>
<td>6</td>
</tr>
<tr>
<td>Quarter-wave vertical loop</td>
<td>4</td>
</tr>
<tr>
<td>Body-shield method</td>
<td>3</td>
</tr>
<tr>
<td>Miscellaneous and special antennas</td>
<td>11</td>
</tr>
</tbody>
</table>

Thus we see that the three-element beam (utilizing a 3/4 wavelength driven element, with one director and one reflector) is best in the lead. Used vertically, it has given better results than horizontally, probably because vertical polarization was used by all the hidden transmitters.

The users of the three-element vertical beam found that as the distance to the hidden transmitter increased, the null point quickly moved off the back of the beam proved the most effective. The beam-type antenna proved more accurate than the loop type because of the fact that loop antennas are bidirectional, and also because 180 degrees displacement of the two maxima could only be obtained when the loop was physically tuned to the exact frequency of the received wave. In other words, the null point of the loop must get out and raise the beam, or to raise it alongside the car from the open car window.

There are several different methods of starting these hunts. Each person may be allowed to start where he wishes, all may be required to start from a certain point, or a certain area may be set aside as the starting area. We have found that setting each person pick his own starting place, whether in or out of the announced area, is the most satisfactory. Receiver interference is practically eliminated by this method. Also, not only in running down illegal transmitters, but also in running off the hidden transmitter is just as likely to find it first as the person starting closest by.

Besides being good training these "illegal transmitter hunts" are quite exciting, and a person who has ever participated in one is likely to see it first as the person starting closest by.

No matter what type of antenna was used, in order to get good results while close to the hidden transmitter, it was necessary (1) to have a well-shielded transmission line, and (2) to use a pair of dextaure the strong signal so that it was being received only weakly. Reflections from hills and along power lines caused quite a bit of confusion when not properly interpreted. Thus readings had to be taken from the high points where possible, and away from power lines.

There were various methods of using the different types of antennas. The horizontal beams generally were mounted on the tops of the cars and controlled from the inside, either by means of a shaft through the car roof or remotely by means of electric motors. The vertical beams could not be worked in this manner due to tree interference while in motion. In this case it was generally necessary to stop for readings, and either to get out and raise the beam, or to raise it alongside the car from the open car window.

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Ham Yarn No. 5

BY WILLET E. BATCHELDOR, WOUMT

In all innocence we bring things upon ourselves. For example, let's take the evening I explained loop modulation to France Paulis. France was the kid who, in 1923, lived just behind my shack in Akron, Ohio, and who pestered me, after the manner of kids, as to how this part and that part of SFIN worked.

Thus one summer night I explained vaguely, "Loop modulation is very simple. That coil of wire sitting in the oscillator tank is in series with that carbon mike. The coil absorbs more or less current from the tank according to the way the resistance of the mike is changed by your voice or other noise. That makes variations in the wave put out by the transmitter and those variations appear as voice in the "phones of whoever happens to be listening."

No mention of carrier shift, frequency modulation or anything like that. Those were the carefree, if not the good old, days.

France left the shack, his round blue eyes bulging as they always did after watching the meters of my 50-watt Hartley twist and twirl with the peaks and depressions of loop modulation.

During the next few days I watched a fifty-foot pole go up in the Paulis' back yard and an inverted Land counterpoise come up to how this part and that part of SFIN worked.

Gradually the thing seeped into my head. I caused current to the ground post. I could still hear SZZZ and that gave me an idea. I connected my mike from the aerial to a ground and called him. We talked all the time you were testing. Boy, was your note rough at first! Boy, oh, boy, my first QSO! Paulis lay down on the cot and practically dissolved in a transport of joy.

Eventually the house wiring quit jumping, the wattmeter settled down to a pleasant howl! and I punched the key. Having nothing better to do, I kept the key down and watched the aluminum form into beautiful sparkling oblongs as the amps went into the air.

Fifteen minutes passed. Time to get a person-to-person report on the new juice-jars I judged. On went the regeneration, out went the loop modulation in a wideband CQ.

Back came a 14-mile distant reply from a ham in Wadsworth, SZZZ. His first remark was:

"Boy, has your modulation come up? Lot louder now, Old Man."

How he argued when I said I hadn't modulated all morning. He insisted, in fact, that he had talked to me all the time I had watched the sparklers. I insisted he was nuts. If I had done any talking, it has been to myself, I moaned.

We signed off, each estimating the other an idiot.

After a period of silent meditation on the mystery, I went about trying to get that extra tenth amp into the aerial as all did in that Marconi-infested period. I hadn't been at that long when into the shack burst Paulis, kneepants, pajama tops, bare feet and blue eyes all excitedly askew.

"I did it! I did it!" he shrilled. "Oh, boy! Oh, boy! My first QSO. Oh, boy."

"Your what?" I screamed. I had brought him up in holy fear of bootlegging although I suspected he slipped a bit at times.

"Yup, my first QSO," he chortled.

"That wouldn't have anything to do with a guy in Wadsworth, would it?" A grim thought was surging through my head.

"Yup.
"You're crazy."

"I'm not. I pulled my new aerial off my receiver when you started testing and it put out an awful spark when I touched it to the ground post. I could still hear SZZZ and that gave me an idea. I connected my mike from the aerial to a ground and called him. We talked all the time you were testing. Boy, was your note rough at first! Boy, oh, boy, my first QSO! Paulis lay down on the cot and practically dissolved in a transport of joy.

During the next few days I watched a fifty-foot pole go up in the Paulis' back yard and an inverted Land counterpoise come up to how this part and that part of SFIN worked.

Some genius should have stayed in radio instead of being perverted into the grocery super-salesman which he became.

M. E. "Bud" Dahl, a WERS op at WKIB in Philadelphia, Pa., and a future ham, decided to combine his two interests of motorcycle riding and radio, and this picture shows the result. His unit, WKIB-153 is shown here after being removed from a saddle bag and set up in a matter of minutes. Features of note are the reflector, which produces an improvement in strength of signals received, and the handset, in which both ends are utilized during operation.

March 1945
20-Year Club

Here is an up-to-date list of amateurs who are members of the 20-Year Club. If you hold an amateur operator license now and have held one for twenty or more consecutive years, you are eligible for membership in this club.

If you meet the requirements, please send a brief chronological history of your ham career to this department. Include the date you started in amateur radio, your call and date on your first amateur license and any other calls you have held up to the present time. If you qualify, your call will appear in the next published roll of 20-Year Club members.

Meet the SCMs

Jack T. Moore, VE5ALA, pictured here, is the newly elected SCM for Northern Texas.

He was born in McKinney, Texas, on July 2, 1907. Upon graduating from high school, he entered Southern Methodist University, from which institution he received a B.S. Degree in Commerce.

Amateur radio claimed his interest in 1920 and two years later he was granted his first license. Since then he has held the calls W5JY and W5ALA. Prior to his election as SCM, he was the general manager of an insurance company in Dallas, Texas. He is an electrical lieutenant-commander, RCNVR.

Amateur radio has done much to keep his interest away from the Army. In addition to amateur radio, he enjoys golf and photography. He is currently employed by the Lockheed Aircraft Corporation as chief radio operator, and previously was associated with the oil business. For recreation he indulges in golf, tennis and boating, but modestly says he has no particular skill in any.

Since his election to the office of SCM on October 15, 1944, those excellent Northern Texas reports have been appearing in the Amateur Activities column regularly.

BRIEFS

An association known as the Hamilton Township WERS Radio Operators Association was formed at a gathering called by H. Dallas Fogg, Hamilton Township, N. J., Radio Aide. Meetings will be held the third Wednesday of every month at 8 P.M. in the township administration building.

The following officers have been elected: William H. Fry, Jr., president; Frederick W. Mulas, vice-president, and Charles H. Frank, secretary-treasurer.

The Month in Canada

ONTARIO—VE1

From L. W. Mitchell, VE3AZ:

The Wireless Association of Ontario had hoped to hold a meeting in January, but due to the unavailability of a suitable speaker, it had to be postponed. However, the February meeting is all lined up and ready, and the nominations for officers for the coming season will be tabled, a large turn-out is expected. The past season has been very successful, with a number of new members enrolling. Hams in the Toronto area are keeping very busy tuning bug, and as the recording bug is gradually taking equipment for the long awaited days when the ether will be filled with QSOs, when happy contacts are once more made, and old friendships renewed. 3RR, Bob Hashlett, has really acquired the recording bug, having completed a Presto recording outfit which he is using in conjunction with a new amplifier using p.p. 6L6s. He delights in taking recordings of dance bands and orchestras off the air, and sending the plate to the band leader concerned. Bob has received some very complimentary letters in reply and seems very happy about the whole thing. Wally Haine, 3IB, our old friend and counselor, is still active. In the good old days, Wally used to handle and distribute most of the QSL cards for the boys around Toronto, and they all used to rack up their care when he called out his long list. 3APA remembers later in 1937 he contacted G8SMF and had a nice QSO for about 30 minutes. He got a report of RST 445 and a promise of a QSL. Nothing more was heard from G8SMF until almost 18 months later when good old IB handed it over. It sure had been around! And what a thrill! With the receiver repair business at a low ebb due to the lack of trained technicians and the gasoline shortage, some of our old boys are using their knowledge and also keeping their hand in by repairing friends' and neighbours' sets. Tubes are a problem but usually a little ingenuity and adapting of substitutes works out very nicely for all concerned.

ALBERTA—VE4

From W. W. Butchart, VE4LQ:

Cpl. Frank William, RCMP, 4ANS, of Ft. Smith, N.W.T., flew into Edmonton during the Xmas holidays in the process of "bringing out" a mental patient, and he paid us a visit a couple of times. Frank, who hails from Frank two years ago when he was at Coppermine Detachment, N.W.T., has been transferred to Ft. Smith, which he tells us has a population of about 260 — 250 of them being Indians! He used to spend a great part of his time with 4YD, Percy "Pete" Pain, of Peace River, back in the days when we were on the air. He has become somewhat of an amateur photographer in recent years, and while here he had one of his pictures published in the Edmonton Journal. Frank told us that after we gave him a bit of a write-up two years ago in this column, noting his QTH, etc., he received quite a few fan letters from hams all over the world!

A really friendly letter from Capt. J. T. Freeman, DSO, MD 13, Calgary, gives us the dope on several of the Calgary and Edmonton boys whose calls have been missing from this column for some time. The following gives the gist (Continued on page 84)
AMATEUR ACTIVITIES

ATLANTIC DIVISION

EASTERN PENNSYLVANIA — SCM, Jerry Mathia, W2BS — A nice long letter from 3IGS states that he is radio operator on a merchant vessel somewhere in the Pacific. He is dreaming of his postwar rig and preparing himself for the time when the ship will dock and he can return to hamming. 3HFD, 3CHH, 3FLH and 3ISS, also ship operators, related many choice yarns. 5AJ, plans call for something far better. 3DMQ shipped out as a merchant marine radio operator. Bob Stevens (LSPm) was writing that he is disposing of his Sky Buddy as his postwar assistant director of the West Gull Division, dropped in to Foster Reynolds (LSPH) is a V-12 at Lawrence, Kans., and Rome, N.Y. He is employed at the Philco crystal labs, and boasts of a baby daughter. A Christmas card, mailed Dec. 10th by air mail by 3GDS, arrived Jan. 19th. The Lovejoy Gang did a fine job in stopping some unauthorized h.f. transmission. 3GYY is just back from the Pacific, where he has seen some action. 3KT was in Philly Jan. 26th. Please keep the reports coming in, 73, Jerry.

MARYLAND- DELAWARE- DISTRICT OF COLUMBIA — SCM, Hermann E. Hobbs, W3CIZ—There is a rumor that our old friend, Bob Caviness, may be released from the Navy soon. Bob used to operate at WMDD-1. It is understood that QV is back in Washington. DQN is reported being seen around town lately. Mr. Phippens is now a full fledged commander, and Tom Pendleton recently received his ham ticket and is planning his postwar rig. Ed Roachell is assistant director in the Philadelphia office. The 3GDS Gang are due here for a meeting in their home for our past meetings and to Mr. Stewart for the FB mills he recently turned out. About a dozen members of the WERS gang attended the hamfest recently held in Baltimore. It seemed like a regular old-time gathering, but with many strange faces in the crowd. The WERS gang is putting itself on the back. The net actually has 3IGS facing the radio operator, and now all of them work on one frequency, 115 Mc. Drop a line if you want to get on the air... As a final note, the WERS Gang reports the number present was very gratifying and proves beyond any doubt that interest and activity among our WERS personnel is running high. Thirty-two operators were attended to toward the organizing of a new WERS unit should be licensed by now but we have no report. Thirty-two operators were attended to toward the organizing of a new WERS unit should be licensed by now but we have no report.

SOUTHERN NEW JERSEY — SCM, Ray Tomlinson, W3GCU—Regional EC for So. N. J., Technical Radio Advisor for U. S. State Defense Council, N. J. State Radio Aide for WERS and Radio Aide for Hamilton Twp. WERS, ASQ; EC for Somerville and vicinity including South Branch, and Radio Aide for Hillsboro/Branchburg Township. WERS, ABS, 3IGS, 3GDS, 3FMU, 3SIW. WERS, USNTO College of Osaska, Clarlesville, Ark., if you can. 4GPW now is an ensign. The WRC has been meeting for some time in the classrooms of CREI, and wishes to thank the CREI for the loan of their room at 7:30 p.m. for code practice. CDQ is the professor-in-charge and the meetings are held the second and fourth Saturdays of each month. It is understood that the code classes may have to be given every Saturday night at 7:30 p.m. for code practice. IBS is located in Ogden, Utah.

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CENTRAL DIVISION

ILLINOIS — SCM, David E. Blake, II, W8NXU—Hundreds of W8XXXs are in training in the Volunteer Radio Service across the State. The Bureau of Radio and Lightship W8XXXs are being utilized for building a club house of its own. The group was officially on Dec. 12th when a big snowstorm had traffic and communications pretty well sewed up. The group was ordered into activity by the sheriff and did a great job, and was later commended by the city and utility officials. Let's hear more from you fellows, especially the boys in far-away places. We like to hear from you and we know you like to hear of each other. Cordial 73, Ray.
his recovery at Rines. Lt. DFD, 9th MAW-TM-USMCAS, Cherry Point, N.C., is finding radio very interesting. RM2c ZZU, c/o Fleet Post Office, San Francisco, Calif., has moved aboard a submarine tender and is standing ready watches. He keeps the field going strong.风湿性关节炎 are some addresses: Lt. SGC, 4518 W. Othello St., Seattle, Wash. B/Sgt. TAX, APO 758, c/o Postmaster, New York. T/Sgt. NZQ, APO 920, c/o Postmaster, San Francisco, Calif. S/Sgt. AXM, Box 151, Scotts Bluff, Neb. F/PAT 438, c/o Postmaster, New York, S/Sgt. MOL, Co. C., 3199 Eng. C Bn., Camp Bowie, Tex. RT3c VWT, Amphibious Communications School, Camp Pendleton, Ocean­ side, Calif. S/Sgt. X. IL G. M. APH-1, 2019 McLaughlin Rd., Sydney, Australia. His home address is: Breendonwood, R. R. 15, Indianapolis, Ind. Lt. (jg) JSL, c/o Fleet Post Office, San Francisco, Calif., PFP, Fleet Post Office 121, N. Y. Y. It's been confirmed that he was the Army's last remaining radio operator for the last nearly four years of active duty. He is back at his old stand in the editorial department of the Chicago Tribune.

LXD - what's the latest? OGT has been moved from Egypt to Korea. Write us for complete addresses of servicemen mentioned in this column. CD-WERS: WDKQ, Downers Grove, is working into the Chicago WHHI networks with very good success. KBO, WHHI Chicago, has given out the information that he now has a new network controlling the crystal-controlled rigs in this south area network. FXX is trying out different types of antennas with WHHI-10. EAL is incorporating frequency equipment with WHHI-102. ITA is building very good remote control equipment for WHHI-102. It is said that WHHI is having receiver trouble from f.m. b.c. stations but otherwise is getting out better. WIF, WHHI-70, is planning a mobile program for the Chicago north area. CAP, WHHI-70, is using the Armstrong and has made contact on Chicago's far north side. CAP-WERS: Capt. TLQ, WAFH, is CAP Illinois Wing Communications Officer. Much experimenting with antennas is holding the timeliness.

England's press and coaxial types are getting a good workout. The CAP is having an extensive program of training which includes code instruction, microphone procedure and radio theory. AARS: What's the news of the Ham Shack Radio System? The best answer we got was "you!" Suggestions: If you are in Chicago's loop on Mondays, drop in at Harding's Restaurant, 7th floor of the Fair Trade Building, and have lunch with a grand bunch of hams. You will hear everything from Einstein's theory in FWY's jokes. Also drop in at 643 N. Michigan Avenue, any day. It's "the Ham Shack" on the Boulevard. I'm sure you will do some high-powered wishing when you see 9WZEE's Hallicrafters display of postwar rigs, 73, Dave.

INDIANA - SCM, Herbert S. Brier, WODGQ - WKMR, Gary, had its approval, operated for another year by the city authorities, along with continued financial support. PUB, ARMlC, was hit by this meeting. "The att will have made AAF radios and other stars and ribbons. VMM passed away a short time ago. He was working as a technician in a war plant at the time of his death, even though he had been a semi-invalid since childhood. PQL in the So. Pacific, thinks it is "right to believe" that YMV is under the supervision of police. YMV is flying a special airplane, with a final examination. An excellent demonstration on a cathode ray oscilloscope was given by Mr. Robert Ellerby, 2nd printer, who now is a little farther up the line with Mac­ donald. YMV has been stationed in Chicago as the skipper of a 75-ft. YP plant at the time of his death, even though he had been a semi-invalid since childhood. PQL in the So. Pacific, thinks it is "right to believe" that YMV is under the supervision of police. 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This is another page in our series about high-quality reproduction. Our page in December QST mentioned in passing that “the output transformer in particular was a husky affair having lots of iron and copper.” With a whole page to write it, we can say lots more about it than that.

Output transformers are apt to be on the skimpy side. They handle the power all right, but the core is run at such a high flux density that there is third-harmonic distortion. This probably does not make much difference in most applications, but in a high-fidelity job you have to guard against introducing distortion anywhere.

Also, the efficiency of the smaller transformers is not too good. We have never made accurate measurements, but the increase in available power is often quite noticeable when a well-designed transformer is substituted for a cheap one.

A transformer may have to handle only a few watts of signal, yet it has more of a job to do than the power rating would indicate. For instance, suppose a pair of 2A3’s supply 7 watts to a 2½-ohm voice coil. The primary must handle 60 ma. of DC plate current plus about 44 ma. of AC signal current, making a total of about 74 ma. Secondary current is about 1.6 amperes. The a.c. voltage on the primary is about 160 volts r.m.s., plate to plate. This current requires more copper and this voltage needs more core than you will usually find in transformers of 7-watts rating.

As a matter of fact, the output transformer should be almost as large as the power transformer in a self-contained amplifier.

The obvious solution to this is to buy a good transformer. This is an excellent solution — if you can find any these days. However, your junk box may be able to help you even if your dealer cannot. A power transformer makes an excellent output-coupling device, so good that we often used them before the war when dealers’ shelves had what you wanted.

The power transformer is run “backwards.” The high-voltage winding is connected to the push-pull plates with the center tap becoming the “B+” connection. The low-voltage winding becomes the output winding. Filament windings connected in series will often provide the proper impedance for voice coils, or the 115-volt winding may be used to couple to a line. It is easy to figure the various combinations if you remember that the impedance ratios are the square of the voltage ratios.

In using power transformers for outputs, we usually removed the primary and all of the filament windings, leaving the high-voltage winding intact. We then wound on a new secondary of heavy wire with just the right impedance. Voice coils have such low impedance that only a few turns are required. Be sure to count the turns in the old primary as you remove it. This will enable you to figure how many turns you will need in the new winding.

Perhaps an example will help. Suppose your transformer has a 115-volt primary and a 750-volt center-tapped secondary, and suppose that you find the transformer has a 690-turn primary. From the ratio of voltages you know that there are 6.52 secondary turns for each primary turn, so there must be 4500 secondary turns. To couple push-pull 2A3’s (5000 ohms plate-to-plate) to a 1.25-ohm voice coil, the impedance must be in the ratio of 5000 to 1.25, or 4000 to 1. The turns ratio must be the square root of this or 63.2 to 1. We found the secondary had 4500 turns, so the new secondary should have 4500 divided by 63.2, or 71 turns.

Modern tubes have largely made obsolete the power transformers having combination 2½-, 5-, and 7½-volt filaments. Many dealers still have such transformers in stock and are offering them at attractive prices and without priority. They are worth consideration as output transformers.

WILLIAM A. READY
director of the Office of Civilian Defense, Washington, D. C., wrote AVH, chief radio aide of WJJH, praising the Cuyahoga County WERS operators on their meritorious service rendered during the East Ohio Gas fire disaster. The Ohio State Council of Defense has recommended that a national award of merit be given to the Cuyahoga County WERS organization, PZA reports that LZE is a m/sgt. in Europe; TV, a new captain in the Navy, passed through Dayton; GD is in the Navy in the Pacific; OFF joined the merchant marine service; and NCB reports that TYJ, a quiet but long ill man; the CRA is sponsoring classes for prospective hams. UFB reports that the Cincinnati Chamber of Commerce requested of CAU, a professor at the University of Cincinnati, to determine the number of radio broadcast transmitters to airport radio activity at the site of a proposed gigantic airport. CAU contacted the Dayton WERS unit which has finished the essential equipment and operators and successfully conducted and completed the survey, which covered frequencies up to the eighth harmonic of the highest broadcast frequency. TQ8 reports plans are being formed to coin the new class of home. TAD remains at the AAF Convalescent Hospital at Ft. Thomas, Ky. Lectures on ham radio background are to be given and transportation facilities are being sought by WKHO, of which TQS is radio aide, to bring able-bodied patients to the hospital. NXX reports that the New York WERS is now at Clinton having some radio activity increased with the addition of several new operators and two new mobile rigs. CBI, on a weekend vacation at home by snowdrifts, says that Dayton WERS is now in the middle of a two-night wave count of QRM which would be caused by several near-by high-power high-frequency broadcast transmitters to airport radio activity. RHH reports signals from Troy and Hamilton and gab sessions, where stories could be swapped as the old gang starts to drift into the old haunts. He also reports that ONI is still at home and is in the home office and that all WERS units are ready for any emergency. Lt. Condr. Hoffinan, ex-FRY, has been given a medical discharge from the Navy and is back at his police radio job, 73.

(Continued from page 66)

FROM FRANCE comes a letter from S/Sgt. Jesse Wescott, secy. of the Northern Wisconsin Wireless, Asn., with news from the Superior area. The club was disbanded shortly after Jesse entered the service, but he has kept in touch with local boys there and they are planning a monthly hamfest, to be preceded by small "Dutch Treat" suppers and gab sessions, where stories could be swapped as the old gang starts to drift into the old haunts. He also reports that ONI is still at home and is in the home office and that all WERS units are ready for any emergency. Lt. Condr. Hoffinan, ex-FRY, has been given a medical discharge from the Navy and is back at his police radio job, 73.

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For more information, visit QST magazine online.
Over three million Hammarlund variable condensers are taking part in the toughest kind of warfare—each is designed and built to do a specific job—with plenty of margin for the unexpected.

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MANUFACTURERS OF PRECISION COMMUNICATIONS EQUIPMENT

ESTABLISHED 1910

OFFICIAL U.S. NAVY PHOTO
ING out his fourth year as t/lsgt. IMG, after seeing service overseas, is back in the states and going to OCS at Fort Monmouth. HRW is a civilian instructor employed by the Army. I hear from the Alfano brothers occasionally. NRI and his wife are in the service, too, former WERS man going to RM school down in Maryland and the latter is a commissioned officer in the Army at a Florida camp. Here’s Freddy’s address: F. V. Sprick, RT3c e/o Fleet Post Office, San Francisco, Calif. Keep the dope coming. 73, W9A.

MIDWEST DIVISION

IOWA - SCM, Arthur E. Rydberg, W9AED - J1H, radio aide for KFHR in Coral Rapids, reports that the FEs and NIW are both in the services. The former was going over the WERS net from VVY and says they have lots of members, with over half of them turning out each drill period. BCK is an engineer at a local b.o. station and is thinking of joining WERS. UAB is with K9IIO in Hawaii. OUG has a new permanent and a new ribbon for his 15 years of WERS. Ex-GHA, who was filling a parish at Delia. He also was fixing a few radios

NEW ENGLAND DIVISION

CONNECTICUT - SCM, Edmund R. Fraser, W1KQY - SQ-WERS: JF, Madison, 1st lt. in the State Guard, reports that five units in Madison, Guilford, Clinton and Westbrook operate weekly on Mondays from 7:30 to 8:30 p.m. Occasional drills are held Thurs. nights with Middletown.

CD-WERS: Eli Crumb, ex-BIJ, Norwich, reports that five units in the city are operating on the WERS net. Ex-FNY was also involved but suffered no serious results. FQB, who was stationed at Pmrl Harbor on “that day,” prior to active service, he was a W9CPS, member of the WAVES. Orchids for some swell

(Continued from page 68)
As one of our DFC boys puts it:

"Going on twenty-five missions is a tough job—

but it's getting back to the base that counts."

... Super-Pros are on the job every minute with the AACS.
Very sorry to have to report the deaths of KM and ZQ. LRQ is working at G.E. in Lyng. Don Jameson (LSPH), awhile. He is stationed at Wright Field, and recently passed
recently became engaged to 7IBC. William L. Peters (9UTN), is a sgt. in the Air Corps and was at M.I.T. for
The following boys send New Year's greeting to the North of Lowell, is going into the Navy. LFD told me that LEM was 1st-class tele­phone exam in Boston. EKG says that he passes his regards to all the 2 ½-meter boys. 4HRW, ex-
On Jan. 5th the South Shore Amateur Radio Club held its
got married, is now a 1 apt. in the Army and is located at

MAINE - SCM, G. C. Brown, WIAQL - CBU is working at Electro, WBE is on duty with the Signal Corps and has been studying at M.I.T. MPF is a t/a.gt. with the AAF in Calif. "Si" Simon, second operator to John in the Signal Corps in Belgium, and says he has met a few ONS, UFB, EIB in the same outfit. AI, ex-AKT, DEO, DFC, GKI, LBE, AWT and MQJ are working at the So. Portland shipyard. Thanks a lot, OM, for the news. If the rest of the gang would send in a few items now and then we could make this an FB report. 73, "G.C."

EASTERN MASSACHUSETTS -- SCM, Frank L. Baker, jr., WIAL - HJL is now EC for Wakefield. JQG says that he is preparing WERS for a new home. Again. LRD is working at M.I.T. LTC tells me that LBU got married, is now a vapt. in the Army and is located at Rochester, N. Y. Sorry to hear that HM's wife passed away. On Jan. 5th the South Shore Amateur Radio Club held its regular meeting at John Eng's (KB'M) restaurant. The following hams were present: JXX, LZW, CT, IS, MMU, FWS, CIC, ITA, IYU, HRF, MD, ex-UQG, BNU, FJN, AKY, CCL, FRY, HU, KID, JAT, IZX, MMF, MPF, EKG, WK, CDP, ALP, R. MacAlpine, Dan Hoxie and Robert and Russell Mugford. IYU now is living in Scituate. Very sorry to have to report the deaths of KM and ZQ. LFD tells me that LEM was home on furlough from Calif.; he is now in the Navy. IFF tells me that LFD is in a hospital in the Washington area. He expects to have his furlough renewed. He is the second operator in the Signal Corps and has been studying at M.I.T. MPF is a t/a.gt. with the AAF in Calif. "Si" Simon, second operator to John in the Signal Corps in Belgium, and says he has met a few ONS, UFB, EIB in the same outfit. AI, ex-AKT, DEO, DFC, GKI, LBE, AWT and MQJ are working at the So. Portland shipyard. Thanks a lot, OM, for the news. If the rest of the gang would send in a few items now and then we could make this an FB report. 73, "G.C."

NEW HAMPSHIRE -- SCM, Mrs. Dorothy W. Evans, WIF7TJ/4 - JBA WEMAC. SCM is a broadcast engineer at WIN in Portland. Ex-BFZ has returned to Banger after a hitch with the AACS. We are very sorry to learn of the passing of BLF's mother, and our sympathy goes to John in his grief. LEI is wearing a commission in the armed forces. Prof. Crabtree, U. of M., is conducting classes in electronics and radio twice weekly in the Bangor High School building. GKI sends in a fine letter via the SCM. "Kyt" is a lieutenant in the Navy and is in the Pacific area. He expects to become a W5 after the war. NKM is RM3e in the Navy. HWY is a sgt. in the AACS and is somewhere in the Caribbean. JBE is in civil service at the Portland Naval Base and also is doing his bit in the CAP. MIR is a 2nd lieutenant in the Signal Corps and has been studying at M.I.T. MPF is a t/a.gt. with the AAF in Calif. "Si" Simon, second operator to John in the Signal Corps in Belgium, and says he has met a few ONS, UFB, EIB in the same outfit. AI, ex-AKT, DEO, DFC, GKI, LBE, AWT and MQJ are working at the So. Portland shipyard. Thanks a lot, OM, for the news. If the rest of the gang would send in a few items now and then we could make this an FB report. 73, "G.C."

VERMONT -- SCM, Burtis W. Dean, W1NLO -- BD, communications officer for the VSG, on Dec. 30th was promoted from captain to major. Roy has been doing a bang-up job in getting WERS going in the various units around the State. A good example is Co. E in Barre. Roy has several capable operators who will make good hams after the war. Recently they have been experimenting with J antennas on 113 Mc. MMV attended an REA convention in Texas recently. GAG has been in Chicago taking special training in telegraph machine maintenance and has returned to Billings, Mont. Your SCM visited BD in Barre and KJG in Montpelier. GAG was in Mont­pelier on business and had a rag-chew with KJG and NLO. Al is taking a special course at Dartmouth College. 73, Burti.
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NORTHERN DIVISION

MONTANA — SCM, Rex Roberts, W7CPY — Over the holidays several of the old gang were heard from. FL, CRE, U. S. Navy, reports from “somewhere” while on active duty and says he recently met BBT, on another ship. A nice card was received from CT, who recently was on active duty and says he recently met ex-BST, on another operator, secy.-treas. and L. Blewett, C. Smith and J. Harrington on the executive board. They report two new members, EQQ, announced that he soon would take unto himself an XYL — Dorothy Hankey, who is also an operator for Northwest. BWH is home in Livingston again and reports that only he and FGB of the gang are left there. 73, Rex.

OREGON — SCM, Carl Austin, W7GNJ — This month’s report would be very flat if it were not for the following from GVC; S/Sgt. HQQ is back at a redistribution center after 34 months in the Infantry in the Southwest Pacific. GUY has moved to Fort Lewis and is building a new home there. The Butte Amateur Radio Club held its annual meeting in January and elected the following officers for 1945: EQM, pres.; EMF, vice-pres.; Jack Picard, Class B, secy. — treasurer and L. Blewett, C. Smith and J. Harrington on the executive board. They report two new members, EQQ announced that he soon would take unto himself an XYL — Dorothy Hankey, who is also an operator for Northwest. BWH is home in Livingston again and reports that only he and FGB of the gang are left there. 73, Rex.

SAN FRANCISCO — SCM, William L. Pemberton, W6WRQ — EQC, DOTT and KZP; OO v.h.f., NJW. Radio Officer BP has visited Australia, C1S still is in the Admiralty Islands; he has been promoted and is now chief warrant officer. KB6JLT is busy at Skaggs Island and has purchased a new home at Eldridge, Sonoma County, Calif. RAI is moving to San Diego for Raytheon. NKE visited RBQ along with RXV, ex-YNIGJ; both are in the Navy and are located at Mare Island. I don’t know that NC2 is back in the Navy and was injured in Europe. He was injured while on the East Coast but is well now. My apologies to Lt. HIP in having listed his call as HLP. Art advises he is living amongst grass shovels down there and the toll of Tammany officials are acknowledged from Lt. OCZ, USNR. Pinky De Lasaux is home for a short visit and has been advanced in rank to Lt. cound. 9ILH and husband, 9ICN, still are in San Diego. RXB has a new SX28A and is installing a V antenna for recording foreign transmissions on the new Presto recorder. NJW bought a home with an eye to postwar rhombic antennas. MVG joined the Navy as S1c and is taking a radio technician course at T-1. 9B5N, of St. Louis, visited RBQ. 9EKY wrote from Treasure Island. NKE wrote from Mare Island, where he has met the following amateurs: RXV/YNIGJ, TQE, 9PUG, 5HA T, 5FZA, CDO, 9CAX, 7ENI, 5TC, 1LEM and R. D. Penny, operator license only. Capt. 7JEA, ex-PPO, who suffered a leg injury, is back at sea. A letter from RM2c 71BC tells of his engagement to Margaret. 73, SCM. 9JEA, W6VLE — Wish some of you hams would take a little interest and send the ASCM some news. Have heard nothing from them or the ARRL, disheartened over the lack of news from QDT, formerly of Modesto, now in Sacramento. HIP, from Treasure Island, called on the SCM a few days ago, and says his class in radio is doing fine. DTJ, at the same place, gave me a call recently. 7JH, an ensign in the Navy, also is at Treasure Island. JBI is honorably discharged from the Navy. He had charge of Diesel engines on a ship. Brownie, as he is called, is a very good ham. QUE, OYF and the SCM are trying to get going on c.c. So, please send in some dope of any of the boys you know of.

ROCKY MOUNTAIN DIVISION

COLORADO — SCM, H. F. Heikel, W9VGC — Carl Drumeller is back on his job in Washington, D. C. after a two-month stay in the hospital. He sends his best regards to the gang. K. B. Warner’s son, Pvt. Richard, Warner, is stationed at Fort Lewis while his father is still in San Francisco. Lt. OCZ, USNR, Mr. and Mrs. Harris of the FCC went through Denver Jan. 12th. The Electron Club and WERS shipped more re-enforcements to the Navy via Great Lakes, Ill., Jan. 20th. That was the day that W6VLE woke up and found that while sleeping he had put a huge G. E. carrier rig on 80 meters! A.M. Jensen, W6BB, W6BQ, W6BB and W6EBT are assisting him in putting up a 240-foot mast at 400 feet above ground level. 7JEA, W6BB — Wish some of you hams would take a little interest and send the ASCM some news. Have heard nothing from them or the ARRL, disheartened over the lack of news from QDT, formerly of Modesto, now in Sacramento. HIP, from Treasure Island, called on the SCM a few days ago, and says his class in radio is doing fine. DTJ, at the same place, gave me a call recently. 7JH, an ensign in the Navy, also is at Treasure Island. JBI is honorably discharged from the Navy. He had charge of Diesel engines on a ship. Brownie, as he is called, is a very good ham. QUE, OYF and the SCM are trying to get going on c.c. So, please send in some dope of any of the boys you know of.

PACIFIC DIVISION

EAST BAY — SCM, Horace R. Greer, W6TI — EC, QDE; EC v.h.f., FKQ; Asst. EC v.h.f., OJU; OO v.h.f., ZM. Jan. 18th saw another WERS meeting at the Oakland City Hall. Charles Haist was guest speaker and some short movies were shown. Remember the third Thursday of each month. These meetings are held for your enjoyment, so plan to be present. TI and TT are installing a portable address system and also an inter-office communications system at the Oakland Chapter of the American Red Cross. In case of disaster, instructions can be given and persons can be called throughout the building. The amplifier and loudspeaker are located near KFXV, one of the stations. It’s kinda hard to pass on all the news by yourself, so how about those letters and postal cards with all the latest service? I know many of the old gang would like to know what’s doing. “Another day closer to victory.” TF.
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Amateur Activities

(Continued from page 74)

trouble shooting the birds, his big trouble is in getting the darn things home after he shoots them. 7IV, formerly of Missoula, Mont., is on the staff of KFEL in Denver. The Western Slope Radio Club came up for air and GDC got the sheriff alone that side of the Continental Divide to scare the club membership out of hiding. MGX was elected president, FQT, vice-president and GLT, secretary. BVZ left Denver and reported for re-assignment and, we hope, a promotion in the Navy. His present rank is 1st, commander, USNR, 70, by Heck.

SOUTHEASTERN DIVISION

ALABAMA — SCM Lawrence J. Smyth, W4GBV — APJ writes that he lacks only two states to make WAS in person. He is now stationed in the Hawaiian Islands. GYJ still is with Radio Intelligence Division of the FCC, S/Sgt. HAN is home from overseas for 21 days and has an XYL. He will be stationed for awhile in Fla. EBD is stationed in Texas and has just been released from the hospital after a short illness. GFW is an ensign in the U. S. Naval Reserve. He is stationed at the Naval Research Lab. in Washington, D. C. He now is editor of the newly-created newspaper of the Washington Radio Club, and WERS operator for the local net, WJDC. He would like to see any of the gang who pass through Washington. DYT writes a newsy letter from India. Plenty of cigarettes and American beer! ECF was home on furlough. ELA is now a warrant officer. He was in Oran, Sicily and the invasion of southern France. Eryson is stationed in Boston. ASR still is working hard to keep up the b.c. end of Daytona radio. BYR is plugging ALP as his relief for EC. I need fellows from the various parts of the State to send reports on amateur activities. Tell me what the fellows away from home and those at home are doing. This column depends on this reporting. You will notice that it is getting smaller each month and contains mostly Miami activity reports. That is because I can get a telephone and get news individually from each key man in my own town. Now what I want is the same reporting from Jacksonville, Orlando, Lake City, Tampa and Sanford. See if you can get something to write about. STYH called me from CAA station WBR and promised a report from the 75 operators there. 73, Larry.

EASTERN FLORIDA — SCM, Robert B. Murphy, W4WAP — WERS activity is on the up and up here in Miami. Although confined to a sick bed, BYF is working very closely with the local boys. 1KVB is working with Mr. and it seems as though we are to expect much activity. Among the newcomers to the organization are: NB, Salmon, Etherer, Povers, Shepherd and others. We are very glad to see such activity. There are about twenty-five active stations at WKENW. Jerguson, a member of this group, is on a traveling job for PAA and is now at Port of Spain. No doubt he will be setting up some 2 3/4-meter equipment to work back to the Miami net. Our new communications superintendent, Mr. Hugh M. Johnston of Pan-American Airways, who comes to us from Brownsville, Tex., is a dyed-in-the-wool amateur, dating back sometime previous to 1919. Mr. Johnston is taking his old job at Mr. B. Carroll, now resigned. ASR sends a Christmas card from Daytona Beach and says that ELD was home for a month's furlough. ELA is now a warrant officer. He was in Oran, Sicily and the invasion of southern France. Eryson is stationed in Boston. ASR still is working hard to keep up the b.c. end of Daytona radio. BYR is plugging ALP as his relief for EC. I need fellows from the various parts of the State to send reports on amateur activities. Tell me what the fellows away from home and those at home are doing. This column depends on this reporting. You will notice that it is getting smaller each month and contains mostly Miami activity reports. That is because I can get a telephone and get news individually from each key man in my own town. Now what I want is the same reporting from Jacksonville, Orlando, Lake City, Tampa and Sanford. See if you can get something to write about. STYH called me from CAA station WBR and promised a report from the 75 operators there. 73, Merf.

WESTERN FLORIDA — SCM, Oscar Cederstrom, W4AXP — War veterans' stories are coming to the front since some of the men who have seen service have returned home. One unusual yarn was told to the OM by G. D. Staheli, ACRM. He was in Hawaii and had planned to take the exams on a certain day and even had a transmitter built ready to go. Late the previous day they received orders to go on emergency patrol. After being out for several weeks, they arrived back at the base late on Dec. 6th. The Jap attack came the next morning, so he was out of luck again. Staheli plans to take exams and is at Sqdn. 7, where Blackman and Watson are teaching communication. Watson came in from Corry and is now at Mainside with Blackman. 6BRG has been on leave here. The OM visited FCT, FJR, and GPN and a nice rag-chew was enjoyed. Lt. R. W. Bond, USN, a radio experimenter from Relay, Md., visited AXP at the communications shop. He (Continued on page 78)
Smart engineering design halves the cost per channel

In this 2500 watt, Collins engineering has struck an ingenious balance of quality, efficiency, and economy.

The right hand cabinet contains two vertical rf sections. Through application of the principles of quick shift (less than 2 seconds) each section can be used interchangeably on two channels, such as may be called for by day and night transmission. These channels are not limited to the pass band of the rf circuits but may be located anywhere within the tuning range of the equipment—2 to 20 mc.

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BURGESS BATTERIES

(Continued from page 79)

has been working with radio for many years. His dad is a radio ham. HIZ, ex-W6, has been taking exams for commercial tickets. Our good friend and ex-ham, Comdr. G. R. Smith, USNR, is leaving this station in the near future. His home town is Osark, Ala. We will miss his cheery smile and so will the boys in his ward at the hospital. DNA is over at Mobile. He has been a bit under the weather with rheumatism. He was up north for awhile, but was glad to get back to the "Sunny South." We had a letter from Hope Plummer, a YL ham formerly of Florida, requesting a copy of Horton Whaley's "The Song of a Radioman." A copy was autographed by the author and sent. Hope loved to put her voice on the air over G1'H in Palm Beach. Another letter arrived from ARMie Herbert M. Claneey, USN, who works in a radio in a plane here and yonder over the Pacific Ocean. He is OK and sends 73 to all the gang. Claneey enjoys the news from over this way which appears in QST. 'Red' Flowers sends his greeting to all from Fort Riley. He keeps up with the doings in the section via QST, which he enjoys very much. He is a tech. sqt. and teaches radio at his camp. DAO has a beautiful radio and part job going up and it really looks swell. He is getting set for the curtain to go up on ham activities when the last shot is fired. Bill Langford got his commercial ticket recently and a grade high enough to give him the higher grade ham ticket. He already holds a Class C. All he needs to do now is to pass on the laws of ham radio. He is experimenting with amplifiers and has built a receiver which works very well indeed. Joe Hicks and Scale, from Ellyson and Whiting Fields, have exciting the shops on business and for ham chats with the OM. Let's hear from you boys in the eastern part of the section and down Panama City way. 73 to all from The Old Machine.

SOUTHWESTERN DIVISION

LOS ANGELES — SCM, H. F. Wood, W6QYV — Fred Stapp, of Inglewood, advises that KGIC has been as active as ever making tests and checks on their recently-activated mobile units. Most of this work is done on Sundays, while the regular drill is held on Monday nights. Stapp also reports that most of the operators are "hams," and that considerable work is being done on new gear; several 112-Mc. superhet receivers are in operation. Had the pleasure of going over the one built by PTR and Earl Rau, who sure did a fine job. Prints are being made up and pictures taken so it, as well as the small crystal-controlled transmitter and receiver that QZG had a hand in, may appear in QST soon. It is very suitable for mobile as well as fixed station operation. Even our "chief," Walt Matney, is building, I hear. Had the pleasure of meeting GWD, of Northern California and more recently with Submarine Signal Co. of Boston, who was here in town on business for a few days. Took him out to see his old friends Seymour Johnson and Curtis Mason of KFI and a good rag-chew ensued. UQL writes that he expects to be home from the Aleutians in the very near future. SSU seems to be getting farther and farther away. Dick writes that he likes the life of a sailor and his duties as operator on board ship but that the ship doesn’t make port often enough. If you want to see more news in YOUR column, send it in to me, please. Ted.

ARIZONA—SCM, Douglas Alten, W6RWW — First of all, I want to thank MLL for taking over this column
THESE low-capacity space-saving switches are used singly and in groups.
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They are particularly adapted to broadcasting, receiving, public address, test instruments and individual uses.
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last month while your SCM had a session in the hospital. I am very sorry to have to report that MLL himself is having another setback—here's hoping you snap out of it quick. Glad! While in the hospital, I had the pleasure of meeting OAS and TBR personally. Wish I might have met more of the Phoenix gang, but circumstances prevented. A swell letter was received from ART's QJL, who is in the Pacific area; he wants to say hello to all the gang. URB sends a wedding announcement. HRR is in the hospital and now rates RM1c. REJ is over on the other side of the globe now; he thinks it is a swell place and gets a chance to do a little fishing now and then. NRP also is in that area. QWG made a trip to sea again, a short one this time, and was able to be home for awhile with that now XYL of his RXQ is somewhere in the Pacific area on a destroyer. The Tucson Short Wave Assn. keeps up its activities. A club within a club has been formed, "25 Division," being a section that leans heavily to the liquid refreshments! Officers are: GS, pres.; C.R. Stover, vice-pres.; Jack Haraway, secy.; Louis Haraway, trea. TCQ dropped over from Willcox and acted as temporary chairman. QAP seems to be having a swell time in South America, though he is passing up shrunken heads as decorations for that postwar shack. DRR is stationed at Davis-Monthon Field. OZM keeps busy with the police, sheriff and Consolidated equipment. Another informative and interesting letter was received from ex-REPC. He writes that he was home over the holidays and got to see a demonstration of the Salt River Valley WERS set-up. He reports that PFL, a capt. in ATC, also was home over Christmas; IUQ is in KA-land; FZQ has been promoted to captain in AACS; KTJ has his 1st-class tele­phone and commercial flying tickets and is teaching at Junior College; LKK is teaching at Phoenix Union High. Didn't get a chance to wish the whole gang the "Best of the Season," so here it is, although belated. May we all be back on the air again, and soon! 73. Doug.

SAN DIEGO—SCM, Ralph H. Culbertson, W6CHV—Asst. SCM, Gordon W. Brown, W6APG—OIN and NDD met with Red Wyatt of Long Beach recently and formulated further plans for the WERS organization here. Application for operator license will be mailed to anyone desiring it. If interested, please call NDD or OIN. Let's go, gang. GCT is back on the job after a long illness. FTT has returned to Raytheon after a short vacation. STC is on a promotion, tie and ROZ are anxious to get going on WERS. SVB says hello and is going strong with his job at the Gas Co. TQR is plenty busy with dots and dashes and playing with carrier current. MXK is back and has opened his radio shop and laboratory in El Cajon. CAV, of Grosmount, is very busy with his radio shop and duties as postmaster. MKW was a visitor in San Diego. A nice letter was received from Ensign Evan Stover, USMS, who was an SWL but now has his own license, issued after Pearl Harbor. Stover and RTQ are in the Far East. "Who's Who in American Universities and Colleges," Baity received his B.S. degree in electrical engineering from the University of Oklahoma in Oct., GLD is now working for KWBU and has obtained both telephone and telegraph 2nd-class licenses. Frank says that although KWBU's studio is located in Dallas and the transmitter in Corpus Christi (better than a couple of hundred miles apart) everything seems to work out nicely. AAN is an ensign in the Maritime Service and advises that he has been pouting brass on merchant ships for the past eighteen months. Trav has been to England, Scotland, North Africa, Italy, Cuba and Panama and is taking a new Liberty ship to the So. Pacific. He advises that he took a cargo of bombs onto the beach the day after D-day in Normandy. He sends his regards to the gang and says he may have something to report later. The SCM thinks that Trav's report on activity up to now is something.

WEST GULF DIVISION

NORTHERN TEXAS—SCM, Jack T. Moore, W5ALA—IfI reports from Brookley Field that HTH now has a San Francisco APO number. Joe wants the address of FCI. JIC, who is in the Navy, will be listed in the 1944-1945 issue of "Who's Who in American Universities and Colleges."

Baity received his B.S. degree in electrical engineering from the University of Oklahoma in Oct., GLD is now working for KWBU and has obtained both telephone and telegraph 2nd-class licenses. Frank says that although KWBU's studio is located in Dallas and the transmitter in Corpus Christi (better than a couple of hundred miles apart) everything seems to work out nicely. AAN is an ensign in the Maritime Service and advises that he has been pouting brass on merchant ships for the past eighteen months. Trav has been to England, Scotland, North Africa, Italy, Cuba and Panama and is taking a new Liberty ship to the So. Pacific. He advises that he took a cargo of bombs onto the beach the day after D-day in Normandy. He sends his regards to the gang and says he may have something to report later. The SCM thinks that Trav's report on activity up to now is something.
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NOW is the time to take the time to prepare yourself for these important, career jobs in radio-electronics engineering. CREI can show you the way by providing you with the "tools" to build a firm foundation of ability based on a planned program of technical training.

In our proved home study course, you learn not only how . . . but why! Easy-to-read-and-understand lessons are provided you well in advance, and each student has his personal instructor who corrects, criticizes and offers suggestions on each lesson examination. This is the successful CREI method of training for which thousands of professional radio men have enrolled since 1927.

Investigate now the CREI home-study course best suited to your needs, and prepare for security and happiness in the coming New World of Electronics! Write for all the facts now.

WRITE FOR FREE 36-PAGE BOOKLET

If you have had professional or amateur radio experience and want to make more money—let us prove to you we have something you need to qualify for a better radio job. To help us intelligently answer your inquiry—please state briefly your background of experience, education and present position.

Capitol Radio Engineering Institute
Home Study Courses in Practical Radio-Electronics Engineering for Professional Self-Improvement
Dept. Q-3, 3224 16th St. N. W., Washington 10, D. C.
Contractors to the U. S. Navy, U. S. Coast Guard and Canadian Broadcasting Corporation
Producers of Well-trained Technical Radiomen for Industry.

(Continued from page 80)

How about it, gang? GSZ is keeping the old rig in working order so that when that certain day comes he can get back on the air plenty quick. Cecil says that he is keeping up his subscription to QST so that he can follow every detail of the good work that the League is doing toward the restoration of the ham frequencies. He thinks every ham should do likewise, in order to back up the only organization that is fighting for us. SN reports from India that JM is a 1st Lt. now, and is stationed on Saipan. Jim says that TQ is not corded, in the Navy and is located in Hawaii. SN would like to know what has become of BAM; as the last report he had, Gene was an ensign on a carrier. JFF and some of the other fellows in FS Pac are working on carrier-current rigs and will advise results later. Luther says the following other hams are doing civilian radio work at Fort Bliss: Ex-ARY, ex-BEB, IAF, IXS and REV; also ENP has been transferred to Lexington Signal Depot while FLJ has been transferred to Camp Barkley. GDH is in the Air Corps Radio Maintenance at Biggs Field and promises news on the other hams stationed there. BNG wants to use Class B audio in a Class B final in his postwar rig, and if he can figure out a way to reduce the distortion by about four hundred per cent, he will really have something—a transmitter with AVC! NW is due congratulations on his re-election as ARRL director. Soupy reports that he will soon be Hartford-bound to attend a meeting on the discussion of ham frequencies. DLP returns to this section as Philco warplant representative for North American and Lockheed at Dallas and Consolidated in Ft. Worth. JJE is working at Lockheed again. ALA is still looking for an SX-24, 7S, Jack.

OKLAHOMA—SCM, Ed Oldfield, W5AYL—Enid's amateur club is functioning regularly although mostly in a social manner. HGN furnished considerable information in that respect. He's doing excellent public and work in Enid, and as a side-line is continuing his frequency checking of broadcast and police stations. He has a real outfit and is adding some General Radio equipment. "Russ" Batters is at his old job with Pillsbury Flour Mills and is quite busy teaching radio courses sponsored by Oklahoma University. CPC is working for "Failing Supply Co." HGN reports that the Enid club assists the C.A.F. with its radio problems even though not actively coordinating with it. Several of its full time club members are still at home and others are overseas with the Army. Will have more dope from the Enid club next month. Regards, Ed.

BRIEFS

Our congratulations this month go to the members of the Milwaukee Radio Amateurs' Club, Inc. of Milwaukee, Wis., who are celebrating their 25th anniversary of affiliation with ARRL, and who are going into 1941 in a year of existence as a radio club group. To our knowledge, the MRAC is the oldest, continuously-existent radio amateurs' club in the world. The club has met and still meets every Thursday evening in the Milwaukee Public Library and Museum, the building in which it first began.

The MRAC has always been an extremely active club, and its members have taken great pride in having excellent lecturers procure for club meetings; in holding the annual QSO party, which has averaged an attendance of from 300 to 500 persons, with some guests coming great distances; in sponsoring other events, such as the 1940 Central Division convention, and in having members on the planning committee of the 1938 National Convention of ARRL in Chicago. In addition, the MRAC has been affiliated with the Chicago Area Radio Club Council for over five years.

Even though the member ranks are greatly depleted now, the old-timers are carrying on "until the boys got back" by maintaining an active WERS set-up, and by issuing a monthly bulletin on club activities which also contains news of members at home and abroad. This bulletin is mailed out to 86 people, and it is hoped that the bulletin has been acknowledged in letters from 76 individuals from all parts of the world. Long live the MRAC!

The Rochester Amateur Radio Association of Rochester, New York, has been holding some fine club meetings attended by about thirty members per meeting. The gang is looking forward to a combination banquet and hamfest to be held in March.

82
RAYTHEON

6AK5

for Broad-Band Amplifiers

in the high and ultra-high frequency regions

For several years Raytheon has been producing for the government a miniature pentode tube so compact and so outstanding in performance that it should be carefully considered by engineers designing future FM, television and amateur equipment.

Interelectrode spacings and element size have been so greatly reduced that the 6AK5 combines the desirable features of low input and output capacitance with high transconductance, reduced lead inductances and lower transit time losses.

It is obvious that "split-hair precision" is required to manufacture the 6AK5, for the distance between the control grid and the cathode is .0035 in.—and the grid is wound with tungsten wire whose diameter is a fraction of that of a human hair.

The 6AK5 is just one example of Raytheon's outstanding ability to build fine tubes for important military use—ability that will be equally evident in the postwar products of the radio and electronics industry.

Specifications of 6AK5

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Diameter</td>
<td>.3</td>
</tr>
<tr>
<td>Maximum Seated Height</td>
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</tr>
<tr>
<td>Filament Voltage</td>
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<tr>
<td>Filament Current</td>
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<tr>
<td>Plate Voltage</td>
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<td>Control Grid Bias</td>
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<td>Screen Current</td>
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<td>Control Grid to Plate Capacitance*</td>
<td>0.01 µf</td>
</tr>
<tr>
<td>Input Capacitance*</td>
<td>4.0   µf</td>
</tr>
<tr>
<td>Output Capacitance*</td>
<td>2.8   µf</td>
</tr>
</tbody>
</table>

*Using RMA Miniature Shield.
The Month in Canada

(Continued from page 81)

of the report: 4AID, H. O. Grinarud of Calgary, is in the Army, still fooling around with radio equipment which is reputedly still on the "secret list." 4AOX, A. B. Tulloch of Calgary, is overseas with the Army. 4CW, Ben Cool of Calgary, is doing quite a bit of movie work, especially in the line of home processing. 4FU, R. F. Bonnett, formerly of Edmonton, is a radio supervisor at one of the air schools in Winnipeg, looking after the installation of radio equipment in planes. He will be remembered by many of the Edmonton boys as the chap who ran the Jan. Richardson Co. station out on 143rd Street years ago. Jack says he hasn't lost any weight! 4EQ, Bill Sundeen, 71, of Calgary, is still alive and well in his home after the serious auto accident he suffered last fall. 4HY, Tommy Hyde of Edmonton, is with RCCS overseas. 4IT, R. McLeod of Calgary, is a major with RCCS, and until recently was in Eastern Canada. 4JA, J. A. Argue of Calgary, was DSO in Winnipeg, but recently moved down East. Of 4JL, Jake Allan, R. L., Edmonton, Jack says he usually manages to see him when in Edmonton. 4OV, F. Reece of Calgary, is doing a good job somewhere overseas. When last heard of he was a signal officer (not with RCCS) with some unit over there. 4UJ, E. H. Heavens of Calgary, is with the RCCS as a "senior op." 4XA, Jack Gillette of Edmonton, is a captain with RCCS overseas, address unknown. 4ZZ, A. W. Morris of Calgary, is an "op" with RCCS. 4TF, Fred Newcombe of Vegreville and Red Deer, is adjutant at the Cambridge Basic Training Centre. Thanks a million for all the dope, Jack; it sure helps out immensely.

A letter from Harvey Runnalls, whose brother is overseas with RCEME, tells me that 4AJV, Harvey Milne of Calgary, is a sergeant in his outfit. I'm sorry to report that 4VJ, Ken Angus of Edmonton, is still on the convalescent list, and not feeling himself at all. Let's hope that things brighten up a bit for him in the very near future.

4ZI, Elwood Irwin of Barons, came across with a few notes on the doings of the Southern gang. 47Z, Vic. Row of Calgary, RCAF, and his XYL are celebrating the arrival of their baby daughter. 4YY, Harry McKee of Lethbridge, who is in the Signal Platoon of the 2nd Battalion Edmonton Fusiliers, is doing some very good shooting in the Canadian Small Bore Rifle Association matches. Their individual scores, which placed them in third and seventh places respectively in the "B" Class competition, were 393-19X and 390-13X. 4XQ, R. Q. of Calgary, is busy instructing NCOs in its care and use. The equipment included walkie-talkie sets, which prove very interesting. 4XG, Dick Bannard, W.O. 1, of Edmonton, has been busy instructing NCOs in its care and use. The equipment included walkie-talkie sets, which prove very interesting. 4XG, Dick Bannard, W.O. 1, of Edmonton, has been busy instructing NCOs in its care and use.

The arrival of long-awaited "wireless' equipment for the Signal Platoon of the 2nd Battalion Edmonton Fusiliers finally arrived and 4LQ, Bill Butchart of Edmonton, has been busy instructing NCOs in its care and use. The equipment included walkie-talkie sets, which prove very interesting. 4XG, Dick Bannard, W.O. 1, of Edmonton, has been busy instructing NCOs in its care and use.

From Art Morley, VE4AAW:

It's been ages since you have seen anything in this section, fellows, but things beyond my control prevented my sending the news down to Headquarters. So please have mercy on me, but others may not have heard of it. 4VJ was posted to Winnipeg a couple of months ago and is working (?) hard. 44J has left the RCAF and is back in civilian life. 4FP also received his discharge and at last report was going back to
Take a look at the size of the
“BATTERY OF TOMORROW”

“EVEREADY” “MINI-MAX” “B” BATTERY
(22½ VOLT)

Here it is—the midget battery that opens up new fields of opportunity in postwar radio and electronics. 22½ volts crammed into a space so small that it staggers the imagination!

“Eveready’s” exclusive “Mini-Max” construction makes all this possible. Actually it has proved a vital factor in improved communication equipment for this mobile war. By the same token this revolutionary “Mini-Max” construction will make possible radically new portable radio sets and other electronic devices after the war—sets for the personal use of an individual. Sets so small they will fit in a man’s vest pocket or a woman’s handbag. The portable radio business, just coming into its own before the war, promises to return with an even brighter future—aided by this midget battery. You can look forward to a new line of merchandise on your shelves—new customers—new business.

Actually, the baby “Mini-Max” “B” Battery in itself is an invitation to creative men to develop new devices to keep pace with it. We urge engineers and designers to consult us—discuss their ideas and problems with our engineers, who are ready and willing to cooperate in every way. The laboratories and technical staff of National Carbon Company are at your disposal.

“EVEREADY”
MINI-MAX
TRADE-MARK
RADIO “B” BATTERIES
NATIONAL CARBON COMPANY, INC.
Unit of Union Carbide and Carbon Corporation

General Offices: NEW YORK, N. Y.
The trade-marks “Eveready” and “Mini-Max” distinguish products of National Carbon Company, Inc.
CRAFTSMANSHIP IN CRYSTALS SINCE 1921
HOLLISTON, MASSACHUSETTS

Fidelity

Precision ground by crystal craftsmen. Valpey Crystals may be relied upon for high fidelity and perfect service under all conditions of operation. Tested in the crucible of war from the Arctic to the Tropics, they have earned their right to prominence in the bright world of tomorrow. Your inquiries are cordially invited.

NOW READY—the first of a series of Valpey Bulletins with Binder—FREE ON REQUEST.

Valpey Crystal Corp.

railroading. 4GC was seen in Winnipeg on leave a few days ago. How about a line with some Navy stuff. Bill got married with the RCAF and is now located in Calgary. Was told that 4BG had received his discharge from the Army and was back in the Peg. 4AEB was seen in Dauphin with an RCAF uniform on. 4CM5 is to be congratulated on the birth of a Jr. op. last week. 4EI is back with CRY. 4FS on last report has been promoted to the rank of Squadron Leader. 4QQ was last heard of in Edmonton. Also heard Bill got married. Had a letter from 4AV, who is overseas with the RCAF. 4CM5 was posted to Souris and promoted to Flight Lieutenant. 4VF has left Winnipeg and gone back to the Ferry Command, this time as a pilot. 4APT is working as a civilian in the radio section of the RCAF station at Portage. 4ARM is with the Army stationed here in the Peg. 4VA, who is in the RCAF, is now in Brandon. 4AFR was presented with a pair of Jr. ops. a short time ago. Congrats, Will, and sorry I didn't see you when I was in Brandon last. 4ABB is with the RCAF at Portage. 4APQ, who returned from overseas some time ago, is now stationed in Winnipeg. 4MP, who was at Yorkton, is now at Gimli. 4BN was last seen at Brandon. 4PZ is at Dauphin. 4AKO recently received his wings at Gimli and is now a full-fledged pilot. 4AX was discharged some time ago. 4LV was another one discharged from the RCAF, but understand he is now with the Army. 2BS was posted to Winnipeg a short while ago. 3AEP, who was one of the signal officers at RCAF Hq., left the Peg to go on a special course. Chuck received his promotion to Flight Lieutenant just before leaving. 4XG, who is with the Navy, was married when on leave. 4JN was posted overseas with the RCAF. 4AJC with the RCAF was promoted to Lieutenant. Harry is on loan to the Fleet Air Arm of the Royal Navy and was in on some of the Tirpitz action. Had a letter from 4ABB, who was with the Aussie Navy but has been discharged after seeing much of the world. He is now working for U. S. Transportation Group and is way down in New Guinea. That's all for now, fellows, and don't forget this is your column. 4AAW is no longer with the RCAF so send your stuff along as I've got the time for it now. The address is 26 Lennox St., St. Vital, Man.

MAILBAG

Fred A. Greene, VE2EP, home again after having served in the RCCS, brings us up to date on the doings of the hams of St. Lambert, Quebec: "All the boys of the Hot-Wire Ammeter Club of St. Lambert are now on active service. Three of the members — 2KB, 2PC and 2QW — have given their lives. 2KY is doing a fine job with the Navy after five years at sea and is now an instructor. 2LR, 2PW and I are furthering instruction for Army officers and NCOs. 2XM at present is in the wilds of the Northwest Territories."

L. J. Fader, VE1FQ, a former reporter for the VE1 district, writes from his latest QTH in England:

"I finally made it and am now stationed in England. We sailed from an American port and were well taken care of by the American Red Cross while waiting to go aboard the ship. We were treated with candy, coffee, and doughnuts and they also had a band from the U. S. Army play to us to boost our morale."

"I spent Armistice Day week-end in Montreal and while there called in to see Alex Reid, the Canadian general manager and also saw 2BV, Fred George, who is a big gun in the RCA plant there. Alex gave me a copy of the plans and proposals for amateur radio, as presented before the FCC. I also was able to take in a tour of the RCA plant and while there I met a couple of other hams who are on the staff. Their calls were VE2LJ and VE3PI. I also met WlIII, from the Camden, N. J., plant, who was visiting the Montreal plant at the time."

After arriving here, I wrote to Capt. Ben Wallich, G6BW, of Churchill, Somerset, and received a reply a couple of days ago. I learned that he since has been promoted to the rank of Wing Commander and is now doing special lecturing for the RAF. He had been on active service up until recently when his health gave out and he was retired. He wishes to be remembered to all the gang and mentions meeting W9USI, who, I take it, is in the Air Force, as G6BW mentions playing on the gramaphone in the officer's mess a couple of recordings that he made over the air of W9USI . . . . "Possibly some of the old gang might care to drop me a line." *

* Address mail in care of ARRL Hq. for forwarding.

(Continued from page 84)
OLD FRIENDS AND NEW ARRIVALS

Many of the parts shown above are old friends that have served communications faithfully for many years. One has passed its 21st birthday, others are new as a kitten. The triangular HX-100 socket is a newcomer, specially designed for such tubes as Eimac 4-250As, 803s and RK-28s. Chokes are available in a variety of inductances, with values up to 10 mh available in the R-100 type. The big R-500 illustrated above has 218 mh, and is provided with taps to make it suitable for use as a timing inductance for frequencies as low as 15kc.
It is with deep regret that we record the passing of these amateurs:

W1KM, Herbert O. Worthley, Malden, Mass.
W1ZQ, Harry C. Pierce, Lynnfield, Mass.
W2NXV, Lt. Paul E. Bowen, Pelham, N. Y.
W4PHE, Oscar L. Olsen, Miami, Fla.
W6PII, Paul L. Clark, Pasadena, Calif.
ex-W7—, Browder J. Thompson, Princeton, N. J.
W8OVN, Lt. George Tarr, AC, Toronto, Ohio
W9CGG, Kenneth Jahnig, Wheaton, Minn.
W9YVJ, Stephen J. Weber, St. Paul, Minn.
G2FR, 1st Rad. Off. C. Hargreaves, N. M.
GM2TQ, Capt. A. Cattanach, Grantown-on-Spey, Morayshire, Scotland
G4AS, Major J. E. Holding, R. Signals, Kirby, Cheshire, England
GM0ND, F/O R. Millar, RAF, Denny, Stirlingshire, Scotland
G6XX, Air Comdr. Viscount Carlow, RAF, London, England
G8IX, F/Sgt. R. W. Rider, RAF, Old Woking, Surrey, England
GS8S, L.A.C. J. G. Stokes, RAF, Sheppey, Kent, England

In every field of action

- The Ohmite Resistors and R. F. Chokes so widely used in radio communications equipment before war came are serving today in vital military and industrial equipment. Their time-proved quality assures dependable control...always. Wide range of types and sizes.

Authorized Distributors Everywhere

The Ohmite Resistors and R. F. Chokes so widely used in radio communications equipment before war came are serving today in vital military and industrial equipment. Their time-proved quality assures dependable control...always. Wide range of types and sizes.

Authorized Distributors Everywhere

<table>
<thead>
<tr>
<th>Type of Vessel</th>
<th>No. of Telephones</th>
<th>Feet of Cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>BB (battleship) Iowa class</td>
<td>1,556</td>
<td>155,000</td>
</tr>
<tr>
<td>CV (aircraft carrier) Essex class</td>
<td>1,358</td>
<td>135,800</td>
</tr>
<tr>
<td>CL (cruiser) Cleveland class</td>
<td>902</td>
<td>90,200</td>
</tr>
<tr>
<td>DD (destroyer) Fletcher class</td>
<td>230</td>
<td>23,000</td>
</tr>
<tr>
<td>DE (destroyer escort)</td>
<td>169</td>
<td>16,900</td>
</tr>
<tr>
<td>APA (auxiliary transport) Hessel class</td>
<td>200</td>
<td>20,000</td>
</tr>
<tr>
<td>LST (landing ship tank)</td>
<td>63</td>
<td>6,300</td>
</tr>
<tr>
<td>LSM (landing ship medium)</td>
<td>32</td>
<td>3,200</td>
</tr>
<tr>
<td>LCI (landing craft infantry)</td>
<td>11</td>
<td>1,100</td>
</tr>
<tr>
<td>PT</td>
<td>10</td>
<td>1,000</td>
</tr>
</tbody>
</table>

Leaving the mess hall after a ham bull session K7FTM pointed out a passing man to his companion, W7I1JY, saying, "That is the guy who works at the North Pole." W7I1JY still dreaming of DX replied — "What's his call?"
(P.S. — The North Pole is the local bakery in that town).
Dear OM:

When you dust off the old rig for midnight sorties into the ether... we're afraid that you're going to find it as outdated as a loose coupler or a rotary gap! The wizardry of war-developed advances in radio communication, once unleashed from necessary censorship, will make most prewar equipment obsolete for postwar use.

When that day—V-day—arrives, and you issue a general call for the newest in transmitter equipment, we'll be standing by. Special antennae, high frequency switches, co-axial cable and fittings and other equipment now being made for the armed service is going to be earmarked for the American ham. Put us on your list for a call!

73's

J.L. Beadle \( \frac{5}{4} \) (W2CQF)

Communication PRODUCTS COMPANY, INC.
346 BERGEN AVENUE, JERSEY CITY 3, NEW JERSEY
IRC METALLIZED TYPE BT RESISTORS

Unexcelled in such essential characteristics as stability, low noise level, low voltage coefficient, mechanical strength, humidity protection, and insulation—IRC type BT resistors have a proven record of performance in millions of applications. Today, after more than a decade of use, these small, sturdy units are recognized as standard around the world.

Available in all wanted ratings.

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IRC makes more types of resistance units, in more shapes, for more applications, than any other manufacturer in the world.

WWV Schedules

STANDARD-FREQUENCY transmissions are made available as a public service by the National Bureau of Standards over its standard-frequency station, WWV, on the following schedules and frequencies:

2.5 Mc. — 7:00 P.M. to 9:00 A.M. EWT (2300 to 1300 GMT).

5.0 Mc. — Continuously, day and night.

10.0 Mc. — Continuously, day and night.

15.0 Mc. — 7:00 A.M. to 7:00 P.M. EWT (1100 to 2300 GMT).

Each of these radio frequencies is modulated simultaneously at accurate audio frequencies of 440 cycles and 4000 cycles, excepting 2.5 Mc. which carries only the 440-cycle modulation. In addition, there is a 0.005-second pulse, heard as a faint tick, every second, except the 59th second of each minute. These pulses may be used for accurate time signals, and their one-second spacing provides an accurate time interval for physical measurements.

The audio frequencies are interrupted precisely on the hour and each five minutes thereafter, resuming after an interval of precisely one minute. This one-minute interval is provided to give the station announcement and to afford an interval for the checking of radio-frequency measurements free from the presence of the audio frequencies. The announcement is the station call (WWV) sent in code, except at the hour and half hour, when it is given by voice.

The accuracy of all the frequencies, radio and audio, as transmitted, is better than a part in 10,000,000. Transmission effects in the medium may result in slight fluctuations in the audio frequencies as received at a particular place; the average frequency received, however, is as accurate as that transmitted. The time interval marked by the pulse every second is accurate to 0.000001 second. The 1-minute, 4-minute and 5-minute intervals, synchronized with the second pulses and marked by the beginning and ending of the periods when the audio frequencies are off, are accurate to a part in 10,000,000. The beginnings of the periods when the audio frequencies are off are so synchronized with the basic time service of the U. S. Naval Observatory that they mark accurately the hour and the successive 5-minute periods.

Of the frequencies mentioned above, the lowest provides service to short distances and the highest to great distances. In general, reliable reception is possible at all times throughout the United States and the North Atlantic Ocean, and fair reception over most of the world.

Information on how to receive and utilize the service is given in the Bureau's Letter Circular, "Methods of Using Standard Frequencies Broadcast by Radio," obtainable on request. The Bureau welcomes reports of difficulties, methods of use, or special applications of the service. Correspondence should be addressed to the Director, National Bureau of Standards, Washington, D. C.
More than just a number, the production of our two millionth crystal is the symbol of long years of work...the product of an experienced organization...the result of technical research in the manufacture of precision crystals. All this, plus adequate facilities, are at the service of the radio industry today. A limited number of inquiries is invited.

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Here's your copy of the most informative catalog of crystal unit design and specifications—just

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Gentlemen: I would appreciate a copy of your new catalog. I am interested in

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FIRM ____________________________________________
ADDRESS _______________________________________
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Work in connection with the manufacture of a wide variety of new and advanced types of communications equipment and special electronic products.

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Western Electric Co.

100 CENTRAL AVENUE, KEARNY, N. J.

*Also: C. A. L.
Locust St., Haverhill, Mass.

Applicants must comply with WMC regulations

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Little Neck, Long Island, N. Y.

---

**World-Wide Advertising via Radiophoto**

A postwar program of global advertising which would utilize radiophoto transmission to flash copy and layout for simultaneous release to publications throughout the world has been announced by the Radio Corporation of America.

This new plan for speedy world-wide advertisements will rely upon the transmission of copy by RCA Radiophoto to world capitals which are equipped with this type of communication. From these radiophoto centers, advertisements will then travel by airmail to an additional network of far-flung cities.

This service was demonstrated twice during the past year. The most recent use of radiophoto advertisement transmission occurred during the observance of RCA's twenty-fifth anniversary, when an advertisement describing the company's pioneering contributions in the field of radio and electronics was speeded to publications in Europe, Australia, Africa, India and the Middle East.

The copy was radiated to the Eastern Hemisphere by RCA Communications offices at New York and San Francisco as the first stage of transmission. As soon as the copy was received in London, Cairo, Stockholm, and Sydney, RCA arranged for publication in these centers and rushed copy to other large cities by airmail.

From London the radiated copy was airmailed to Lisbon, Madrid, and Cape Town for distribution to Spanish, Portuguese, and South African publications. From Cairo the radiophoto was flown to Istanbul and Bombay for publications in North Africa, the Middle East, and India. Copy received at Stockholm was dispatched to Swedish publishing houses. Sent from San Francisco to Sydney, the radiophoto advertisement was airmailed to other cities in Australia and New Zealand.

By the combined use of radiophoto and rapid airmail delivery, the RCA anniversary advertisement was made available to 12,500,000 persons in 47 countries in a matter of hours and days instead of the weeks and months ordinarily required for this type of coverage. Transmitted in English, the advertisement was translated at the point of receipt and appeared in a total of 274 newspapers and magazines published in 18 different languages and dialects: Afrikana, Arabic, Dutch, English, French, Portuguese, Spanish, Swedish, Turkish and nine Hindu dialects.

Early in 1944 RCA used radiophoto transmission for an advertising campaign in connection with Motion Picture Academy Awards. The day after the awards were announced in Hollywood, an RCA advertisement, carrying the names of the winning motion pictures and their principals, was transmitted by radiophoto to London, Cairo, Sydney, and Buenos Aires for use in publications there and for relay by airmail to publications in other countries.
The Navy must have instruction books which show its personnel how to install, operate, maintain and repair vital electronic equipment. If you are familiar with radio and electrical terms and symbols...can study pre-production models...and then put the essential facts and material into written form—Raytheon has a place for you as a technical writer.

WRITE TO:
Lee A. Ellis, W 3HSB, Raytheon Manufacturing Company, Field Engineering Division, Waltham 54, Massachusetts.

We'll teach you all you need to know about our products—show you how to gather and assemble the facts and build them into book form. Bring yourself up-to-date in this fascinating, highly promising field of electronics. The opportunities for personal development and advancement are practically unlimited. In addition to serving your country in a most essential industry, you will be preparing for a brilliant future in the post-war electronic field. Write for full details, today.

Devoted to Research and Manufacture of Electronic Tubes and Complete Electronic Apparatus and Systems
The Signal Corps has brought the use of homing pigeons to new peaks of service in the science of military communications but it has not yet solved the mystery of the strange instinct that drives these birds with such certainty to their proper destination.

The mystery is deepened by the apparent, though not conclusive, proof that pigeon-instinct is directly affected by radio waves. A recent series of tests by the Signal Corps supports the belief that radio transmission confuses the birds and retards them in fulfilling their flying missions.

Three successive tests, with three different groups of birds, were recently made and all brought virtually identical results. Each group consisted of ten birds, and was subdivided into two smaller groups of five birds each. All were held in a radio station just ten miles from their home loft. While this radio station was transmitting, the first five were released; and about 15 minutes later, with the radio station silenced, the second five were liberated.

These birds released while the station was transmitting seemed completely bewildered. They circled erratically, very close to the station, for 15 or 20 minutes, then took off uncertainly for their lofts, requiring a total of 42 to 52 minutes to complete the ten-mile flight. The birds that were released while the station was silent made the usual brief circling, then took off promptly for the home loft with no confusion whatever, covering the total distance in 18 to 21 minutes. There was very little difference in the results of the three tests. In every case the birds that were hampered by radio transmission bungled their tasks. In every case where there was no transmission the birds performed with the easy confidence which pigeoners have learned to expect. All the birds were of similar type and training. All flew under practically identical conditions of wind and weather. Not a single bird upset the theory of flying noticeably better or worse than his mates under the same handicaps or advantages.

As the Signal Corps is slow to accept any theory on the basis of a few tests, there will be many more before the connection of radio with the homing instinct is conclusively established.

Many times during the pursuit of the Nazis toward Germany, when wire could not keep immediate pace with fast-moving armored columns, the Signal Corps met the need by introducing a system of v.h.f. radio relays.

This radio-relay system consists of stations 25 to 100 miles apart, each beamed on the next. The military possibilities of this system were developed in America and England after it was first tried out in North Africa.

Police-car radio equipment had been procured for expected police communications requirements in North Africa. This equipment was found admirably suited to provide communications for...
YOUR OWN USE of the Browning Signal System may be quite different from the job it has performed so successfully since before Pearl Harbor: detection of intruders.

If you will read the illustrated folder which describes this unique application of a balanced electronic circuit, you will be stimulated to visualizing other uses to which you can put it.

THE BROWNING SIGNAL SYSTEM

While we are spending every man-hour available on war production, we have jotted down in our lab notebooks certain interesting improvements we want to make in the Signal System. We'd like to add to those notes whatever thoughts you have on the subject. Your own application may call for entirely different design plans, and we want to be able to offer exactly what you will want in the Browning Signal System. Get the booklet today, or, if you already have it, tell us now what you want in this System.

Browning Laboratories, Inc.
750 Main Street
Winchester, Mass.

Gentlemen:
I already have your folder. Here are the new uses to which I might put Browning Signal Systems, together with notes on what I would like to see built into them:

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

NAME

TITLE

COMPANY

ADDRESS

Browning Laboratories, Inc.
750 Main Street
Winchester, Mass.

Gentlemen:
I want to learn more about your Signal System as it exists today. Please send your folder to:

NAME

ADDRESS
NEW D-20 SERIES . . .

This UNIVERSAL dynamic will be the first new microphone made and distributed by UNIVERSAL since Pearl Harbor. It will meet present and postwar needs for amateur use, as well as other purposes. UNIVERSAL will continue to manufacture microphones and electronic voice communication components for the Army Signal Corps. The D-20 will be available to the armed forces and for essential home front needs. Bulletin 1458 describes the new model.

UNIVERSAL MICROPHONE COMPANY
Inglewood, California

On the "Battle Wagons . . .

It's Premax Antennas

• The favorite Antennas of the amateurs are now doing outstanding service on vessels of the Allied Fleets. When Victory comes, they will be back, tested in war and ready for peace.

Premax Products
Division Chisholm-Ryder Co., Inc.
4519 Highland Avenue • Niagara Falls, N. Y.

(Continued from page 84)

the rapid advance. As a result of this successful experiment and concurrent British groundwork, the amazing radio-relay link equipment in use today was developed in the U. S. and in England, and was made to provide four teleprinter circuits plus three radiotelephone circuits as compared with one teleprinter circuit of the experimental models in Africa.

For communication with the United States a high-powered, multi-channel, 40-kw. Army transmitter was installed by the Signal Corps in France. Packed into 1000 boxes in which it had been shipped across the channel, it required 45 soldiers-technicians to reassemble the equipment. Because of its complexity a minimum of a month was believed required to install the transmitter. However, in 25 days, the American station was sending and receiving trans-Atlantic messages.

Major General George L. Van Deusen (Commanding General of ESCTC at Fort Monmouth since 1942) is now Chief of Engineering and Technical Service in the office of the Chief Signal Officer, succeeding Major General Roger B. Colton, who is now Air Communications Officer in the Air Forces Technical Service Command in charge of radio communication activities at Wright Field, including Aircraft Radio Laboratories.

Brig. General Frank E. Stoner, Chief of Army Communications Service, was recently nominated for Major General.

Dr. Frederick E. Terman was recently appointed Dean of the Stanford University School of Engineering. He will assume his new duties upon release from his present position as the head of the Radio Research Laboratory at Cambridge, Mass., where he is in charge of the wartime development of radar.

In 1941, Dr. Terman served as president of the Institute of Radio Engineers, being the first man to be chosen for that position from west of the Atlantic seaboard.

Dr. Terman is the author of five well-known texts on radio engineering.

TO THE XYL
(Dedicated to all XYLs having a husband overseas.)

If you'd ask me to be your beau,
My answer would be WILCO;
And if you'd only want a stand-by,
I'd always be willing to comply.

If you'd only send your 88s,
I'd be happier than all my mates.
But should you send only 73s,
I'd be much happier overseas.

If just once in a while you'd QST,
You'd never know what it would mean to me.
I'd answer your little billet doux,
And say my heart belongs to you.

— Frank D. Atwood, RM1c, W1KEQ
IN ORDER to give our Eastern customers better, faster service, we have opened a big new store at 115-117 W. 45th Street in New York City. Effective immediately, the entire combined stocks of our New York and Chicago stores are BOTH at your command. In New York, the Newark store will be under the personal management of Adolph Gross, well known in eastern territory. The new facilities are large, well located, and expertly staffed. As in our Chicago store, the sales policy will conform to Newark's reputation for prompt and courteous service.

SCHOOLS, COLLEGES, BROADCAST STATIONS, INDUSTRIALS
As distributors for all the well known manufacturers in this industry, we solicit your priority business on all types of radio, radar, communications and sound equipment. Send your order to your nearest NEWARK store for ALL the things you need RIGHT now. We ship on short notice, direct from our own stocks whenever possible, and promptly advise probable delivery on balance of order. You will be amazed how efficient real SERVICE can be under present day conditions.

SPECIAL OFFER of Oil Filled, Oil Impregnated FILTER CONDENSERS
To celebrate the opening of NEWARK in New York, we feature this brand new offer of quality filter condensers, guaranteed at rated voltage. No Priority Required.

<table>
<thead>
<tr>
<th>Mfd.</th>
<th>DC</th>
<th>Size</th>
<th>Weight</th>
<th>Price</th>
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<tr>
<td></td>
<td>1000 V</td>
<td>5 x 3¼ x 1¼</td>
<td>10 oz.</td>
<td>$0.59</td>
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<tr>
<td>0300 V</td>
<td>4½ x 3½ x 1¾</td>
<td>2½ lb.</td>
<td>1.50</td>
<td></td>
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<tr>
<td>1000 V</td>
<td>4½ x 2¾ rnd. can</td>
<td>12 oz.</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

2 MFD and 4 MFD in one can
600 V 2½ x 2½ x 1¾ 14 oz. $0.80

THORDARSON TRANSFORMERS (Power Transformers and Chokes)
Immediate delivery on Priority L265 or Better

<table>
<thead>
<tr>
<th>Mfd.</th>
<th>Type</th>
<th>V.C.T.</th>
<th>M.A.</th>
<th>Price</th>
</tr>
</thead>
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<tr>
<td>T-70R61</td>
<td>770 V. C.T. at 70 M.A.</td>
<td>$3.36</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.3 V. C.T. at 3 A, 3 V. at 2 A, 4½ lbs.</td>
<td>4.41</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T-70R62</td>
<td>700 V. C.T. at 145 M.A.</td>
<td>5.29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>115 V. 60 Cycle 6.3 V. at 5 A. 5 V. at 30 amp. 9 lbs.</td>
<td>7.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T-45556 or T-92R21</td>
<td>leads out of side</td>
<td>1.41</td>
<td></td>
<td></td>
</tr>
<tr>
<td>778 V. C.T. at 200 M.A. 115 V. 60 Cycle 6.3 V. at 5 A.</td>
<td>2.82</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 V. at 30 amp. 9 lbs.</td>
<td>2.82</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ELECTRIC CO.
CHICAGO ★ NEW YORK
323 W. Madison St. 115-117 W. 45th St.
DEArborn 0083 BRYant 9-4735
RADIO CHASSIS PUNCH

Saves hours of work cutting clean, accurate holes in radio chassis—for connectors and other receptacles. Simply insert cap screw in hole to be enlarged (drill small hole if necessary), turn with ordinary wrench to force punch through the metal. No reaming or filing—hole is smooth and clean. No distortion—die supports metal. Ten sizes from ¾" to 2¼"; also up to 3 1/4" for meters. Write for free catalog 33E to Greenlee Tool Co., 1863 Columbia Ave., Rockford, Ill.

CODE SENDING RECEIVING SPEED

Get Skill, Accuracy Quickly

Learn to send and receive Radio Code at home or in camp, or prepare for higher proficiency and rating through same easy practical system used in training radio-telegraph specialists. Our world famous system teaches you code by developing in you a "knack" of sound senses and quick reflexes of speed and accuracy that is the secret of speedy sending and receiving. Thousands of operators need, and want, a Signal Code Practice Set. Learn at home quickly. Big opportunities now and peacetime possibilities appear equally promising.

FREE 52-PAGE BOOK explains complete training method and shows how to become a crack operator. Rush name for it today. It's absolutely FREE.

CANDLER SYSTEM CO.
P. O. Box 928, Dept. 4-C, Denver, Colo., U. S. A.

Electricity FOR RADIO AND ELECTRONIC APPLICATIONS

Onan Electric Generating Plants supply electric service for electronics applications and general uses, mobile, or stationary. Driven by Onan-built gasoline engines, they are of single-unit, compact design and sturdy construction.

Over 250,000
Now in Service

D. W. ONAN & SONS
2621 Royalton Ave., Minneapolis 5 Minnesota

Polyphase Systems Applied to R.F.

(Continued from page 15)

Power Considerations

A word about power input and output might be in order. Since each coupling is adjusted to draw 70.7 per cent of the available transmitter output, it might be thought that the power in the plate circuit becomes greater when both couplings are in use. This is not the case, however, since neither the d.c. plate power input nor the r.f. power output has increased. In the case of the antenna shown in Fig. 8, we are not getting a gain of 3 db. in all directions simultaneously. The fact is that the lobes are rotating at a supersonic rate, thus giving the same effect as a mechanically-rotated system which is revolving at the same speed.

The curves of Fig. 10 show the grid voltages and their resultants, and from these it can be seen how the plate and antenna currents flow.

In conclusion we might state that while this article illustrates only a few possibilities, the future should provide many interesting extensions and variations of the idea.

Attention! — Inventors

(Continued from page 44)

6) Double-action solenoid:

A small, fast-acting double-action solenoid to operate on 28 volts d.c., with a stroke of about 0.5 inches, with a 20 pound pull (or push) at condition of maximum air gap. The plunger should "seat" at each end of travel and would very probably have to be an electromagnet whose polarity would reverse at each end of travel.

Suggested solutions to these problems should be prepared in sketch and description form and sent to the National Inventors Council, Department of Commerce, Washington, D. C., for consideration and report.

Please do not send your suggestions or solutions direct to the ARRL.
Radio and electronic products built by Delco Radio are serving in every theater of war... helping to coordinate the action of all units of the armed forces. Good performance is essential. Dependability must be insured under extreme conditions of service. These characteristics are attained through Delco Radio's effective combination of engineering vision, manufacturing precision. Delco Radio Division, General Motors Corporation, Kokomo, Indiana.

KEEP BUYING WAR BONDS
Radiocommunication Service

(Continued from page 46)
as in the amateur band, these matters will not be
determined by rule or regulation. It should be
possible by the use of comparatively simple
circuits already known to provide both trans­
mitters and receivers tunable over all or most of
the 460-470-Mc. range and emitting signals
sharp enough to minimize interference.

"The bands both above and below 460-470 Mc.
are assigned to other services; but the allocation is
such that if the utility and requirements of
citizens radiocommunications warrant, the band
can at some future time be expanded. Alterna­
tively, if a demand for assignments in this
band does not arise, the band can be reassigned
to another service at a later date.

"The essence of this new service is that it will
be widely available. Accordingly, only the mini­
imum requirements of the Communications Act
plus a few minimum traffic rules will be set up.
Operator licenses will be granted only to citizens
of the United States. To procure such a license,
an applicant need only show familiarity with the
relevant portions of the Communications Act and
of the simple regulations governing this service.
No technical knowledge will be required. It is
hoped that the license can be in the form of a
small card, with the operator's license on one side
and the station license on the other, and that these
will remain in force for five years with simple
renewal provisions. Station licenses will be limited
to point-to-point, fixed point-to-mobile, mobile­
to-mobile, and multiple-address communications;
broadcasting is not contemplated.

"A concomitant of the widest possible avail­
ability is that particular licensees are not ac­
corded protection from interference. A license in
this service does not guarantee the right to a
channel; it affords rather an opportunity to share
with others the use of a band. The success of this
arrangement in the amateur bands gives every
reason to believe that it will be equally successful
in the citizens radiocommunications band. In the
event that intolerable abuses arise, the Com­
mission will of course take steps to eliminate them.
The 10,000 kc. width of the band will no doubt be
sufficient, however, to make possible simultaneous
and efficient use of the limited-range service for
many purposes, with serious interference limited to
few if any parts of the country.

"In any areas where serious interference is ex­
perienced, it is the expectation of the Commission
that various users of the band in a particular
community will jointly seek, perhaps through
local organizations similar to the American Radio
Relay League in the amateur field, cooperatively
to solve local problems of interference and to
ensure maximum utilization. The new service is
essentially a local service; the problems will differ
widely in an urban and rural area, in the moun­
tainous West and the flat Middle West, etc. The
Commission is prepared to cooperate with loca­
local organizations similar to the American Radio
Relay League in the amateur field, cooperatively
in the citizens radiocommunications band. In the
event that intolerable abuses arise, the Com­
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sufficient, however, to make possible simultaneous
and efficient use of the limited-range service for
many purposes, with serious interference limited to
few if any parts of the country.
The modern 50-kw broadcast station requires powerful tubes like the water-cooled husky at the right. These large triodes represent a substantial investment—must be dependable, fully efficient.

The water-cooled transmitting tube with tungsten filament and copper anode was pioneered by General Electric in 1919. Since that time the record has been one of continuous development and progress. At one time 500 to 1,000 hours was the average life of a high-power transmitting tube. Today this term is but a fraction of what may be expected in period of service.

Numerous technical improvements have punctuated the years since these large tubes were developed. Some of the most significant apply to the current models GL-862-A and GL-898-A as against their predecessors. One such important advancement is the self-supporting filament and grid structure, which obviates the need of internal insulators, as well as helps do away with the problem of “transients” such as temporary over-voltage.

New G-E production methods and equipment made possible by large demand have brought about substantial cost savings. The price of these tubes recently has been lowered from $1,650 to $750—a drop of more than one-half!

Prices, ratings, performance charts, and other descriptive data will be furnished on request. Write to Electronics Department, General Electric, Schenectady 5, New York.

Hear the G-E radio programs: “The World Today” news, Monday through Friday, 6:45 p.m., EWT, CBS. “The G-E All-Girl Orchestra,” Sunday 10 p.m., EWT, NBC. “The G-E House Party,” Monday through Friday, 4 p.m., EWT, CBS.

GENERAL ELECTRIC

101-03-8880
A "Handbook" on Leyte

(Continued from page 89)

ably with 6L6 or 6F6 output stages, was con-

tinued. Eventually a five-station network was in

operation, every station in the net being capable

of working Australia. The calls were varied occa-

sionally to fool the Jap eavesdroppers. The most

popular transmitters used had two 6L6s in push-

pull driven by two 6F6s. A four-tube push-pull

parallel arrangement was tried, but it did not

prove practical. Personnel of the radio net finally

numbered 60, of whom 15 were former Bureau of

Posts operators. Some of these already knew the

Continental code; those who didn't learned it

from the still-indispensable Handbook.

Having been successful with self-excited rigs,

Lt. Richardson and his crew, quite in the amateur

tradition, wanted to branch out and try something

more ambitious. Someone located a portable po-

lice rig, about the size of a walkie-talkie, which

had been sent to Leyte before the war and never

used. It was far too small for the kind of work

they were doing, but it did have crystal control.

The crystal's frequency was too low, but turning

again to "that wonderful book" they found a
doubler circuit. After considerable difficulty, even-
tually they got on the air with a T1 crystal note.

Their triumph did not last long, however.

Within an hour or so the elements in their only

5Z3 shorted, and the smaller rectifier tubes from

the BCL sets could not stand up under the load.

Jap-Dodging Brasspounders

Never imagine that any of this equipment build-
ing, code learning, and station operating was done
under ideal conditions of peace and quiet. The
Japs were plenty active, and they had good direc-
tion finders. Many other clandestine stations
throughout the Philippines were located and cap-
tured, but Lt. Richardson lost only one station —
and even then his men all escaped. He attributes
this success in eluding the Japs to the fact that
he changed the station locations every two or
three weeks. Because of the strength of the guer-
illa forces, the Japs could not move quickly to
suppress the American stations by using small
patrols. Instead, after determining the exact loca-
tion of a station, they had to organize a heavily
armed expedition. By the time they got ready to
strike, Richardson and his crew would be some-
where else.

Lt. Richardson is safely back in the United
States today, his career as a "home-grown" radio
engineer ended — at least for the present. Navy
authorities state that his work on Leyte was of
tremendous value, that the information he sent
over his homemade transmitters played a vital
part in the successful invasion of the Philippines,
undoubtedly saving thousands of American lives.

In view of the way he accomplished these re-

sults, we ARRL members can justly take pride in
our Handbook. If no other copy than that one dog-
eared 1932 volume had ever been printed, all of
the time, money and hard work that have gone
to make The Radio Amateur's Handbook the best
practical radio text on earth still would have been
well invested.
For harmonics up to 30 kc/s at ±75 kc/s swing, distortion is less than 1.5% rms for modulating frequencies between 50 and 15,000 cps.

Metal-plate rectifiers—first introduced by Westinghouse for high-voltage, high-current AM applications—virtually eliminate outages caused by rectifier (tube) failures. Space and cooling requirements are reduced, operating costs are lowered.

Your nearest Westinghouse office has complete details of this new triumph in FM transmitter design in booklet B-3529. Or write Westinghouse Electric & Manufacturing Company, Radio Division, Baltimore, Maryland.
NEW
1945
EDITION
The Radio
Amateur's
HANDBOOK

Paving the way for postwar amateur development, particularly on the ultra-highs (microwaves) and other prospective new techniques, the 1945 Edition of the "Radio Amateur's Handbook" includes diversified material new to its scope, while still retaining its time-proved treatment of the orthodox theory and practice of amateur radio—refined, modernized, reorganized for maximum convenience whether used as text, reference or constructional manual. This Edition of the "Handbook" contains more pages and more information per page than any "Handbook" yet published. . . . Every subject encountered in practical radio communication is covered, arranged for maximum convenience to the reader, sectionalized by topics with abundant cross-referencing and fully indexed. . . . More than ever the ideal reference work, the 1945 edition also contains practical constructional information on tested and proved gear—always the outstanding feature of the "Handbook." . . .

$1 Postpaid in Continental U. S. A.
$1.50 Postpaid Elsewhere
Buckram Bound $2.00

AMERICAN RADIO RELAY LEAGUE, INC.
West Hartford 7, Conn., U. S. A.

School. Had it not been for ham radio the valued opportunity might have by-passed him—and jobs were scarce, those days. . . . The newest ham in this month's array of first offenders is Norman J. Snyder, W31IRD (p. 42). Norman didn't start until 1938, but he certainly made up for lost time after receiving his license. Although his ham activities reduced his scholastic record to approximately zero, somehow he graduated from high school despite that fact. W31IRD was an avid participant in most every ARRL contest, and was also an active ORS, AARS, and a member of the famed RCC. Holder of a code proficiency award with a 25-w.p.m. sticker, Norman now is a radio technician at RCA. In his spare (?) time he has been experimenting with television, f.m. and electronic keys—or so he claims. . . .

Repeaters again with us this month are George M. Guil, W8VAN (Splatter, December, 1944, p. 8), and Arthur H. Lynch, W2DKJ (Splatter, January, 1945, p. 16).

Although this column has not so far recorded the life and times of John Rogers, W2ADC, his exciting drawings have been highlighting the "Hams in Combat" yarns for several months. That fact alone would merit space for a Rogers write-up in these pages, but we have an even better reason. In digging through old QSTs recently we came across one of W2ADC's earliest QST efforts—a cartoon appearing in the March, 1926, issue. To show the difference 18 years has made in his technique, we offer a comparison between the 1926 cartoon (reproduced herewith) and the realistic wash drawings on p. 48.

She: "Oh, John, I wish you'd quit this amateur game and turn 'pro.' See how much money Red Grange made."

Queried about his ham activities in that period, he informs us: "I have held 2ADC since 1923. Only 16 when I received my ticket, 2ADC cut quite a swath with those two five-watters on 200 meters! After graduating from high school I attended the Art Students League in New York City. Rushing home from classes early in the afternoon, I handled some of the traffic so plentiful in those days. In the years since then I have been off the air for long periods and must have forgotten most of what I knew about the technical side of radio. (Continued on page 10/)}

Splatter
(Continued from page 90)
TERMINAL HAS MICROPHONES IN STOCK!

Shure 55C Unidyne — Acclaimed as the best
Price, $29.10 — F.O.B. New York

Shure 717B Crystal Economy Hand Microphone
Price, $5.85 — F.O.B. New York

Turner BX Crystal Economy Microphone
Fits all stands
Price, $5.85 — F.O.B. New York

Electro-Voice V-1 Velocity Ribbon Microphone
Finest of its type

Large Selection of Other Types By All Manufacturers In Stock!

DELUXE 30 WATT POWER AMPLIFIER
Six input channels — 4 microphone; 2 phonograph
Controls — 4 microphone gain; 1 dual phono gain;
1 master gain; 1 treble cut & boost; 1 bass cut & boost
Double tone control for finest equalization
Wide range, hum and distortion free response
4 — 8 ohm speaker sockets with switch to select speak-
ers and proper impedances simultaneously
500 ohm terminal strip for multiple speaker systems
Gray wrinkle steel case with handles and hinged top
Size 20 x 10½ x 10½, for 105-125V 60 cycles AC.
Tubes — 6-6SQ7; 1-6SJ7; 2-6L6G; 1-SZ3
MODEL 6729 — PRICE, $57.15 NET WITH TUBES.
F.O.B. NEW YORK

IN STOCK — Utah Public Address Speakers

<table>
<thead>
<tr>
<th>Model</th>
<th>Size</th>
<th>Normal Impedance</th>
<th>Power</th>
<th>Peak Power</th>
<th>Magnet</th>
<th>Price F.O.B.N.Y.</th>
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</thead>
<tbody>
<tr>
<td>8P</td>
<td>8&quot;</td>
<td>6-8</td>
<td>7</td>
<td>11</td>
<td>5 oz.</td>
<td>$ 3.38</td>
</tr>
<tr>
<td>10P</td>
<td>10&quot;</td>
<td>6-8</td>
<td>9</td>
<td>14</td>
<td>12 oz.</td>
<td>$ 5.44</td>
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<tr>
<td>E12P</td>
<td>12&quot;</td>
<td>6-8</td>
<td>13</td>
<td>20</td>
<td>12 oz.</td>
<td>$ 9.41</td>
</tr>
<tr>
<td>G12P</td>
<td>12&quot;</td>
<td>8</td>
<td>17</td>
<td>26</td>
<td>46 oz.</td>
<td>$14.26</td>
</tr>
</tbody>
</table>

- Priority Requirements Change Daily
- Write for Catalogue on Terminal Sound Specials
- Write Us For Up-To-Date Information On The Items You Need

TERMINAL RADIO CORP.
85 CORTLANDT ST., NEW YORK 7, N.Y. Tel Worth 2-4415

DUSTLESSTOWN, OHIO

It's the little things that loom biggest in the manufacture of
delicate electrical measuring
instruments. Little things like
specks of dust or breath con-
densation can play havoc
with accuracy. That's why
Triplett Instruments are made
in spotless manufacturing de-
partments; why the air is
washed clean, de-humidified
and temperature controlled;
why every step in their mass
production is protected. As a
result Triplett Instruments
perform better, last longer
and render greater service
value.

Extra Care in our work
puts Extra Value in
your Triplett Instru-
ment.

ELECTRICAL INSTRUMENT CO. BLUFFTON, OHIO
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<td>$2.50 per year*</td>
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<tr>
<td>a. Standard Edition</td>
<td>$1.00**</td>
</tr>
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<tr>
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*In the United States and Possessions
**Postpaid in Continental U. S. A.
- $1.50, postpaid, elsewhere.

(No stamps, please)

THE AMERICAN RADIO RELAY LEAGUE, INC.
West Hartford 7, Connecticut

---

But the thrill of a DX QSO and general all-around operating has never left me. My ham rig still stands in my studio, very near my drawing table, waiting for that day! ..." A newspaper and advertising artist since 1926, W2ADC at present is on the staff of the New York daily, *PM*. Attending the return of ham radio, these days all his spare time goes into his work with water colors — at which, he reports, "some progress has been made, as I was awarded the American Water Color Society Medal in 1944."

---

**FEEDBACK**

In QST for December, 1944, on p. 25 (third paragraph), the first sentence should refer to high-frequency response instead of to low-frequency response.

In the January, 1945 issue, p. 39, the upper portion of switch *S* in Fig. 1, between the detector and the modulated oscillator, should be reversed; when properly connected, the right-hand connection is made to the 7A4 and the left-hand connection is made to the 7C5. The movable switch arm remains grounded.

In Fig. 1 of the article, "A Homemade Radio-Range Receiver," in the February issue, the rotor of *C* should be grounded, and *C* should be inserted between the bottom of *L* and ground.

---

W2IXY advises that cards have been received from F3RA and ON4VU that they are safe and would like to hear from friends over here.

Following a meeting of its directors on January 18th, The Radio Club of America, Inc., the oldest radio organization in continuous existence, announced the re-election for the 1945 term of the same officers who served the previous years, as follows: president, F. A. Klingenschmitt; vice-president, O. James Morelock; treasurer, Joseph Stanley; corresponding secretary, M. B. Sleeper; recording secretary, John H. Bose; publicity chairman, Austin C. Lescarboura.

---

While many hams bemoaned the lack of the "Happy New Year" greetings formerly exchanged over the air, Lt. D. D. Duva, WINEA, was having a fine time with his toy-horn QSOs in a Sacramento night club. His log includes W6HUB, W8FRW, and an assortment of operators from the various services. This is an old hamfest trick, of course, but WINEA gave it a new twist — with good results.

---

**Strays**

RF Inductors • RF Chokes • IF Transformers
Condensers • Mica Molded Condensers • Trimmer
Condensers • Miscellaneous Apparatus
The F. W. Sickles Co., Chicopee, Mass.

**SICKLES** Electronic Specialties
PERFORMANCE TESTS

Insure Operating Efficiency

The demand for and ready acceptance of Astatic sound detection, pickup and reproducing products, is due to their dependable performance and high standards of operating efficiency. Assembly line workers are under constant supervision and every Astatic Microphone, Pickup, Cartridge or Recording Head is subjected to exacting tests before stocked for delivery. You'll HEAR MORE from Astatic products.
**H A M- A D S**

1. Advertising to pertain to radio and shall be of nature of interest to radio amateurs or experimenters in their pursuit of the art.

2. No display of any character will be accepted, nor can any special typographic arrangements, such as all or part capitalization, be allowed to make any advertisement stand out from the others.

3. The face rate is $0.25 per word, except as noted in paragraphs (4) below.

4. Remittance in full must accompany copy. No cash or continued discount or agency commission shall be allowed.

5. Closing date for Ham-Ads is the 25th of the second month preceding publication date. A special rate of $0.20 per word will be allowed.

6. A special rate of $0.20 per word will apply to advertising which, in our judgment, is obviously non-commercial in nature and is placed and signed by a member of the American Radio Relay League. Thus, advertising of bona fide surplus equipment, used, and for sale by an individual or group for his personal use in advertising or for sale as a group is not allowed.

Having made no investigation of the advertisers in the classified columns, the publishers of **QST** are unable to vouch for their integrity or for the grade or character of the products advertised.

---


**COMMERCIAL** radio operators examination questions and answers, one dollar per copy. O. C. Walker, WATV, 6340 Washington Blvd., Tulsa, Okla.

**WHY NOT turn your unused equipment into ready cash which you have?** W9ARA, Butler, Mo.

**CRYSTALS** available -- all types, including 100 kc., 465 kc., and 100 kc. Broadcast and Aircraft frequencies. Write today for list of special equipment. U by a member of the American Radio Relay League. Thus, advertising of bona fide surplus equipment, used, and for sale by an individual or group for his personal use is not allowed.

**CHAT RENTAL** for rent. Write for our catalog. Henry Radio Shop, Wilmington #278, Delaware.

**RESISTOR** wire wound, nationally known make. 3000 ohms, 2 watts. Remove wire to make any desired value. For making servicing equipment, shunts, multipliers, experimenting, etc. Five for $1.00. Radioco, 1110 T Marshall Bldg., Cleveland, Ohio.

**TURNTABLE** with motor for 78 r.p.m. wanted. Please describe. J. V. Fitzhugh, A.R.R.L. Hqts., 38 La Salle Rd., West Hartford, Conn.

---

**FIELD SERVICE ENGINEERS**

for Domestic and Foreign Service

**MUST POSSESS GOOD KNOWLEDGE OF RADIO**

**Essential Workers Need Release**

**HAZELTINE CORPORATION**

58-25 Little Neck Parkway

Little Neck • Long Island
"HOGARTH, I HAVE A FEELING WE'RE NOT ALONE. MAYBE YOUR FRIENDS WILL GO AWAY IF YOU TURN OFF YOUR ECHOPHONE EC-1"

ECHOPHONE MODEL EC-1
(Illustrated) a compact communications receiver with every necessary feature for good reception. Covers from 550 kc. to 30 mc. on 3 bands. Electrical bandspread on all bands. Six tubes. Self-contained speaker. 115-125 volts AC or DC.

ECHOPHONE RADIO CO., 540 NORTH MICHIGAN AVE., CHICAGO 11, ILLINOIS
16000 Series
Transmitting Condensers

A new member of the "Designed for Application" series of transmitting variable air capacitors is the 16000 series with peak voltage ratings of 3000, 5000, and 9000 volts. Sturdy construction, thick, round-edged, polished aluminum plates with 1¼" radius. Constant impedance, heavy current, volts. Sturdy construction, thick, round...

James Millen Mfg. Co., Inc.
Main Office and Factory
Malden, Massachusetts

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All of the above advertisers are cooperating with the A.S.R.I. to permit publication of an editorially adequate QST during the period of war-rationing of paper. Using less advertising space but at higher rates, they continue their customary support of QST. Some are using smaller space in each issue and some are using space only every second or third issue. Of the latter, those whose third issue does not appear in this particular issue are indicated by the ** above.
EVERYONE interested in the reproduction of sound—engineer, tradesman, instructor, student or layman—should own these four Monographs. Published by the Jensen Technical Service Department in the interest of improved sound reproduction, they are the first four numbers of a series. Up-to-date in factual information, replete with useful charts, graphs and tables, they supply a world of data, hitherto unobtainable, to guide in the selection, installation and operation of loud speakers. You will want not only these four numbers but the rest of the series as announced from time to time.

MONOGRAPH No. 1: "Loud Speaker Frequency-Response Measurements." Deals with one of the most interesting and controversial subjects in the field of acoustics. Discusses, among other topics, frequency response of the human ear, the influence of environment on frequency response, the practical aspects of frequency response measurements. Amply illustrated with charts and graphs.

MONOGRAPH No. 2: "Impedance Matching and Power Distribution." Discusses such subjects as multiple speaker connection, volume control, design of efficient transmission lines, and conversion of volume levels to power and voltage. The text is supported by twenty-eight drawings and tables. More than a score of questions are described, illustrated and solved, including a comprehensive sound system for a military installation.

MONOGRAPH No. 3: "Frequency Range in Music Reproduction." What frequency range is needed for high fidelity reproduction? What are the maximum, useful audio frequency ranges under actual listening conditions? What are the practical limitations on high fidelity reproduction even if perfect transmission, reception and reproduction were possible? How much change in high frequency cut-off is required to be just noticeable to the listener? All these and many more questions are answered in this Jensen Monograph.

MONOGRAPH No. 4: "The Effective Reproduction of Speech." Explains why faithful speech reproduction requires a frequency band almost as wide as for music, while amplified speech for strictly communication purposes may be reproduced satisfactorily within a narrower band because in this case the principal emphasis is on such things as articulation, loudness, masking, and power requirements. Presents useful conclusions and practical information for everyone interested in speech reproduction.

Get any or all of these Monographs today from your Jensen jobber or dealer. Fill in the coupon and send with it 25c for each copy desired, or clip a dollar bill to the coupon and get all four.

JENSEN RADIO MANUFACTURING COMPANY
6611 South Laramie Avenue, Chicago 38, Illinois
Send me:

□ Loud Speaker Frequency-Response Measurements
□ Impedance Matching and Power Distribution
□ Frequency Range in Music Reproduction
□ The Effective Reproduction of Speech

(Check one or more. Send 25c for each book ordered.)

NAME ________________________________
ADDRESS ________________________________
CITY ____________________________ ZONE ________ STATE ______

FREE to men in the Armed Services, and to Colleges, Technical Schools and Libraries.
Output CW—5 KW; Output Phone—3 KW 100% modulated with a pair of Eimac 450TL tubes in class “B” audio; continuous coverage from 2 MC to 18.1 MC with 11 preset channels in that range and complete manual coverage throughout whole range. Capable of completely unattended remote control operation and of A1, A2 and A3 type emission. Audio characteristics: plus or minus three DB from 150 to 3,500 cycles. Total harmonic distortion less than 10%. The transmitter can be terminated into a 50 to 1,200 pure resistive load at zero degrees phase angle. 70 to 850 ohm load at plus or minus 45 degrees and 100 to 600 ohms at plus or minus 60 degrees.

This Collins type 231D-11 (Navy TDH) radio transmitter is an outstanding demonstration of the value of capable engineering coupled with the intelligent choice and use of vacuum tubes.

It is the latest of a series of Collins Autotune, quick shift transmitters which were originally introduced in 1939, and which use Eimac tubes in the important sockets. In the 231D-11, two Eimac 750TL tubes in parallel make up the power amplifier, while a pair of Eimac 450TL tubes in class “B” are used as modulators for voice and MCW emission.

Mr. F. M. Davis, General Manager of the Collins Engineering Division, says: “Eimac tubes have been found to be reliable, rugged and capable of withstanding the severe overloads encountered during equipment tests, without damage.” Statements like this, coming from such men as Mr. Davis, offer proof that Eimac tubes are first choice of leading engineers throughout the world.

Write for your copy of Electronic Telesis—a 64 page booklet fully illustrated—covering the fundamentals of Electronics and many of its important applications. In layman’s language.
NATIONAL RECEIVERS ARE IN SERVICE THROUGHOUT THE WORLD

NATIONAL COMPANY
MALDEN MASS., U. S. A.
RCA HIGH-VALUE RECTIFIERS?

RCA-816
HALF-WAVE MERCURY-VAPOR RECTIFIER
125 mA @ 1750 volts RMS input

RCA-5R4-GY
FULL-WAVE HIGH-VACUUM RECTIFIER
250 mA @ 700 volts RMS input per plate

TECHNICAL DATA

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<tr>
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<th>5R4-GY</th>
<th>816</th>
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<tr>
<td>Fil. Volts (A.C.)</td>
<td>5.0</td>
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<tr>
<td>Fil. Amp.</td>
<td>2.0</td>
<td>2.0</td>
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<tr>
<td>Max. Overall Length, inches</td>
<td>5-5/16</td>
<td>4-11/16</td>
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<tr>
<td>Base</td>
<td>Micanol; Med.</td>
<td>Small 4-pin</td>
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<tr>
<td>Cap</td>
<td>Yes</td>
<td>Yes — base down only</td>
</tr>
<tr>
<td>Mounting: Vertical</td>
<td>With pins 1 and 4 in vertical plane</td>
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<td>Horizontal</td>
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<tr>
<td>Peak Inverse Volts</td>
<td>2800</td>
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<td>Peak Plate Milliamperes</td>
<td>650 per plate</td>
<td>500</td>
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<tr>
<td>Average Plate Milliamperes</td>
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<tr>
<td>For Condenser-Input Filter</td>
<td>250 max. @ 1400 volts*</td>
<td>500</td>
</tr>
<tr>
<td>For Choke-Input Filter</td>
<td>175@ 1500 **</td>
<td>100</td>
</tr>
<tr>
<td>Warm-up Time, Seconds</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

For power supplies for low- and medium-power stages of transmitters, and for other electronic apparatus, these two RCA rectifiers fill a real need. Both are sturdily built to give dependable, low-cost service.

THE FOUNTAIN-HEAD OF MODERN TUBE DEVELOPMENT IS RCA

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RCA VICTOR DIVISION • CAMDEN, N. J.